Appendix E

LAND USE AND VALUE CAPTURE ANALYSIS (STRATEGIC ECONOMICS)

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LAND USE AND VALUE CAPTURE ANALYSIS (STRATEGIC ECONOMICS)

STRATEGICECONOMICS INC

MEMORANDUM

Date: October 1, 2014

To: Josh Switzky and Nick Perry, San Francisco Planning Department
Paul Bignardi, MTA

From: Nadine Fogarty, Sarah Graham, and Alison Nemirow

Subject: Central Subway Extension Value Capture Analysis – Final Memo

Introduction

The San Francisco Planning Department and the Municipal Transportation Agency are studying the potential to extend the T Third Line north from Chinatown[1] through North Beach and Russian Hill to Fisherman's Wharf (referred to as T-Third-Phase 3 or the Central Subway extension). As part of this broader study, the City and County of San Francisco (the City) engaged Strategic Economics to evaluate the potential for land-based value capture mechanisms to help pay for the capital costs of the project. This memorandum presents the results of the value capture analysis. Overall, the analysis finds that value capture mechanisms are likely to pay for a relatively small share of the project, in the range of 5 to 20 percent of total construction costs.[2] The limited potential for value capture to cover project costs is related to the fact that the area around the proposed stations is largely built out, with few remaining major development opportunity sites. As a result, new development is expected to account for no more than 10 to 35 percent of the total amount that a value capture mechanism could contribute to project costs.

The following section summarizes the approach to the analysis. Subsequent sections provide a discussion of the transit alignments and land use scenarios tested, the value capture tools that have the greatest potential to contribute to the Central Subway extension financing strategy, the methodology used to calculate value capture revenues, and results of the analysis. Additional information about potential value capture mechanisms and a description of the methodology and key assumptions are provided in the appendices.

Approach

A significant body of research has demonstrated that the introduction of new transit service typically results in increased local property values and new development, with the effects most concentrated

[1] Chinatown is the terminus of Phase 2 of the Third Street Light Rail Transit Project, known as the Central Subway, which is currently under construction.
[2] The magnitude of the potential contribution from a value capture mechanism would depend on factors including the alignment and financing mechanism selected, and extent to which local land use regulations are changed to allow greater building heights. These factors are discussed below.

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within a quarter- to half-mile around the transit stations.[3] Although estimates of this transit price premium vary widely from study to study, most studies have found premiums in the range of 5 to 15 percent for properties located within a quarter- to half-mile of a transit station.[4] Given the scarcity of state and federal funding for transit projects, local governments and transit operators are increasingly interested in using property-based financing mechanisms, or "value capture" tools, to capture some portion of this increased property value in order to pay for transit infrastructure. In order to evaluate the potential to use value capture tools to help pay for the Central Subway extension, Strategic Economics conducted the following tasks:

1) Evaluated a range of potential value capture mechanisms to identify financing tools that might be used to capture value from the Central Subway extension project;
2) Projected future development and estimated future assessed property values near potential stations; and
3) Estimated the amount that might be "captured" using specific funding mechanisms, including the total revenues generated over time as well as the estimated bonding capacity associated with those revenue streams.

The analysis evaluated three potential transit alignments, as well as three land use scenarios with varying levels of increases in maximum allowable building heights. These are discussed below.

Transit Alignments and Land Use Scenarios

The City is studying several possible alignments for the Central Subway extension, which could potentially include up to three new transit stations. This analysis focused on three potential alignments that are under consideration; all would be below ground[5]:

- **Alignment 1:** Columbus Avenue, with stations at Washington Square Park (Columbus Avenue and Powell Street) and Joseph Conrad Square (Columbus Avenue and Beach Street).
- **Alignment 2A:** Powell Street, with stations at Washington Square and the Kirkland Bus Yard (the intersection of Powell and Beach Streets).
- **Alignment 2B:** Powell and Beach Streets, with stations at Washington Square, Kirkland Yard, and Conrad Square.
- **Alignment 3:** One-way loop on Powell Street, Beach Street, and Columbus Avenue, with stations at Washington Square, Kirkland Yard, and Conrad Square. This concept was not analyzed separately, but the potential for generating funding through value capture mechanisms is expected to be similar to Alignment 2B.

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[3] See, for example, Nadine Fogarty et al., *Capturing the Value of Transit* (Center for Transit Oriented Development, 2008); Keith Wardrip, *Public Transit's Impact on Housing Costs: A Review of the Literature*, Insights from Housing Policy Research (Center for Housing Policy, August 2011), http://www.nhc.org/media/documents/TransitImpactonHsgCostsfinal_-_Aug_10_20111.pdf.

[4] Note that the majority of studies have focused on residential development, with most of those focused on single-family homes. However, several studies have also found that commercial properties experience a premium associated with proximity to transit. For example see Rachel Weinberger, "Light Rail Proximity: Benefit or Detriment in the Case of Santa Clara County, California?," *Transportation Research Record: Journal of the Transportation Research Board* 1747 (January 1, 2001): 104–13, doi:10.3141/1747-13; Ghebreegziabiher Debrezion, Eric Pels, and Piet Rietveld, "The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-Analysis," *Journal of Real Estate Finance and Economics* 35, no. 2 (June 2007): 161–80; Kate Ko and Xinju (Jason) Cao, *Impacts of the Hiawatha Light Rail Line on Commercial and Industrial Property Values in Minneapolis* (Center for Transportation Studies, University of Minneosta, June 2010), http://www.cts.umn.edu/Publications/ResearchReports/.

[5] The City is also studying potential surface alignments.

Strategic Economics projected new residential, hotel, retail, and office development within a quarter-mile of the proposed stations (the "station areas"), based on local real estate market trends and the Planning Department's analysis of development capacity in the station areas. For each alignment, three land use scenarios were tested:

- **Scenario A – Current Zoning:** Current zoning and height regulations remain in place
- **Scenario B – Moderate Height Increase:** Maximum height limits are increased from 40 to 55 to 65 feet around the Conrad Square and Kirkland Yard stations.
- **Scenario C – Maximum Height increase:** Maximum height limits are increased from 40 to 65 to 85 feet around the Conrad Square and Kirkland Yard stations, with additional height increases to 55 feet for selected blocks between Jefferson, Beach, and North Point Streets.

Identifying Potential Value Capture Tools

State law authorizes local governments to use a variety of property-based financing mechanisms to help pay for capital projects by capturing a portion of the increased property values expected to result from the provision of new infrastructure. In order to determine which tools have the greatest potential to contribute to the Central Subway extension, Strategic Economics reviewed the full range of value capture mechanisms available to the City. These mechanisms are listed in Figure 1. Each tool has specific implementation requirements and other regulatory limitations, such as voting requirements, that are discussed in detail in Appendix A. Appendix A provides a more comprehensive overview of all tolls available and considered.

As shown in Figure 1, Infrastructure Finance Districts (IFDs), Mello-Roos Community Facilities Districts (CFDs), and special assessment districts have the greatest potential to help fund the construction of the Central Subway extension. An IFD would divert a portion of future General Fund revenues generated within a defined geographic area around the subway stations from the existing property tax rate in order to help fund the project. IFDs do not add any new fee or tax obligations to property owners, but instead divert money from the City's General Fund and allow the City to bond against this revenue stream. In contrast, a CFD or special assessment district would create a new, additional annual charge on property within a defined boundary.

Development impact fees can also be used to capture value created within a district in order to pay for a local improvement, and the City has previously created district-based impact fees to help fund transportation-related and other improvements identified in community plan areas (e.g., Eastern Neighborhoods, Market and Octavia). However, the City is in the process of studying a citywide Transportation Sustainability Fee (TSF) that would replace or serve as a credit against existing transportation-related impact fees. TSF revenues are projected to fund a $1.4 billion expenditure program over 20 years. The Central Subway extension would likely be eligible for the funding under TSF Expenditure Plan. However, TSF revenues are not tied to specific projects or geographic areas; revenues will flow into a citywide fund and be used to pay for eligible projects throughout San Francisco.[6]

[6] The City could also consider creating an additional transit-related impact fee in the station areas to help fund the Central Subway extension, although the TSF would serve as a credit against any such fee. Any additional fee would need to be based on a nexus analysis showing that the additional fee is mitigating transportation impacts not otherwise being offset by the TSF.

Figure 1.Summary of Value Capture Mechanisms

Mechanism	Revenue Source	Applicable to Central Subway Extension?
Infrastructure Finance District (IFD)	Future increases in revenues from the existing property tax (tax increment)	Likely
Mello-Roos Community Facilities District (CFD)	Special tax on property	Likely
Special Assessment District	Assessment, usually of property	Likely
Community Benefit Districts and Property & Business Improvement Districts (CBDs/PBIDs)[(a)]	Assessment of business licenses or property	Unlikely; another type of Special Assessment District is more likely to be appropriate
Development Impact Fee	One-time fee on new development	Possible[(b)]
Parcel Tax	Special tax on property	Unlikely; CFDs are more typically used for this type of project and parcel taxes present no clear advantage over a CFD
Sale or Ground Lease of Public Land	Sale or ground lease of publicly owned land for new development	Unlikely; limited City-owned land in station areas[(c)]
Property Transfer Fees/Benefit Covenant	Fee on future sales of new units in development on land sold by a public agency	Unlikely; limited City-owned land in station areas[(c)]

(a) Type of special assessment district.
(b) The City is in the process of studying a citywide Transportation Sustainability Fee (TSF) . New development in the station areas would be subject to the TSF, and a Central Subway extension would likely be eligible for the TSF Expenditure Plan. However, TSF revenues will not be not tied to specific projects or geographic areas; revenues will flow into a citywide fund and be used to pay for eligible projects throughout San Francisco. The City could also consider creating an additional transit-related impact fee in the station areas to help fund the Central Subway extension, although the TSF would serve as a credit against any such fee. Any additional fee would need to be based on a nexus analysis showing that the additional fee is mitigating transportation impacts not otherwise being offset by the TSF.
(c) See Land Use and Development Section (Section 3) of main report for discussion of Kirkland Yard.
Source: Strategic Economics, 2014.

Estimating Value Capture Revenues

For the three district-based tools with the greatest potential to contribute to the Central Subway extension financing strategy – IFDs, CFDs, and special assessment districts – Strategic Economics worked in conjunction with City staff to develop reasonable assumptions about how the districts would be structured, based on existing City policy and past precedents where available. In order to compare the magnitude of funds associated with different tools, the analysis assumed that each would generate revenues from all properties located within a quarter-mile radius around the proposed Central Subway extension transit stations.[7] The analysis also assumed that the districts would generate revenues over a period of 30 years beginning in 2017 (i.e., through 2047), and that those

[7] A quarter-mile radius around the stations was selected as the appropriate study area because research has shown that the property value benefits from new transit service are typically greatest within a short distance of the stations.

revenues would be used to issue bonds in order to finance the construction of the Central Subway extension.

For comparison and informational purposes, Strategic Economics also estimated the revenues that could be generated within the station areas from the City's proposed Transportation Sustainability Fee. However, these revenues would flow into a citywide fund and could be used to pay for projects throughout San Francisco, while revenues generated elsewhere in the city could be used to help pay for the Central Subway extension.

The detailed assumptions used to model the financing mechanisms are described in Appendix B. Note that all values presented below are preliminary estimates based on the assumptions described, and are intended to represent the general magnitude of funds that could be raised using different tools. Additional analysis would be required in order to select and implement the appropriate tool or tools to help pay for the Central Subway extension. Implementation would also require meeting the specific implementation requirements and other regulatory limitations of the selected tool(s), such as requirements for voter approval.

Results of the Analysis

This section discusses the findings from the analysis. For the sake of simplicity, the following findings discuss detailed results for Alignment 1. Full results for all three alignments are provided at the end of this section.

- **Assessed values in the station areas are expected to increase by more than 200 percent over 30 years.** Figure 2 shows the projected increase in total assessed property value associated with the various land use scenarios for Alignment 1. The 2047 assessed values reflect a one-time, 5 percent increase in market values associated with the introduction of rail transit. Five percent is a conservative estimate of the property value premium conferred by proximity to a new transit investment, based on a review of recent literature.

- **The majority of assessed value increase is generated by appreciation and turnover of existing development.** Because the development opportunities in the station areas are relatively limited, new development contributes a relatively small share (24 to 34 percent in Alignment 1, depending on the land use scenario) of the total increase in assessed value between 2017 and 2047 (Figure 2). Higher intensity land use scenarios allow for more new development and therefore result in greater increases in assessed value over time.

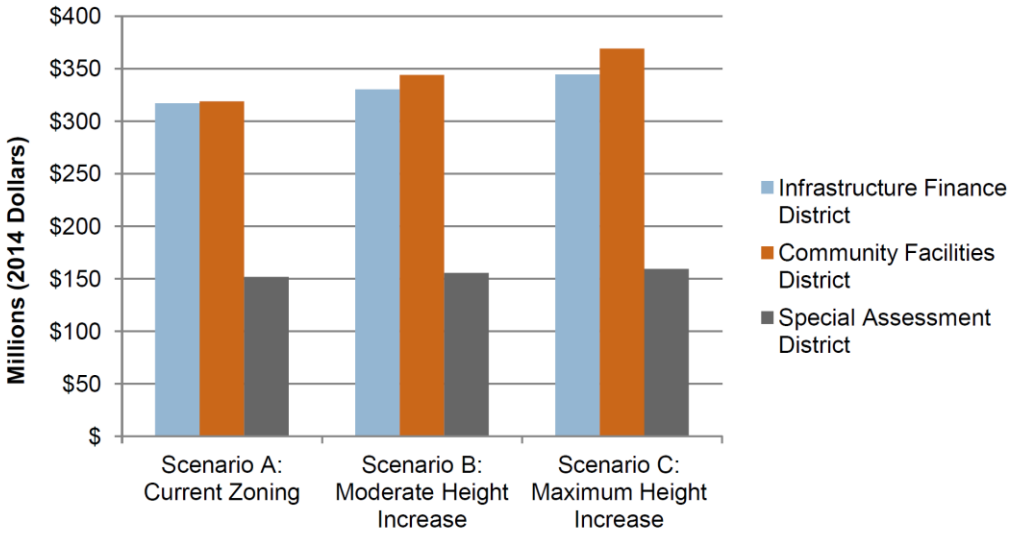
Figure 2. Projected Increase in Assessed Values: Alignment 1 2014-2047 (in 2014 Dollars, Millions)

	Scenario A: Current Zoning	Scenario B: Moderate Height Increase	Scenario C: Maximum Height Increase
Existing Assessed Value, 2014	$2,319	$2,319	$2,319
Appreciation & Turnover of Existing Development, 2014-47	$3,835	$3,766	$3,735
Total Assessed Value of New Development, 2014-2047	$1,198	$1,563	$1,918
Total Assessed Value, 2047	$7,352	$7,648	$7,972
Total Change in Assessed Value, 2014-47	$5,033	$5,329	$5,653
Percent Change in Assessed Value, 2014-47	217%	230%	244%
New Development as a Percent of Total Change	24%	29%	34%

Source: Strategic Economics, 2014.

- **The CFD and IFD are expected to generate between $320 and $370 million over thirty years, while a special assessment district would generate approximately $150 million (in 2014 dollars).** Figure 3 compares the total projected revenues in 2014 dollars for the three types of financing districts for Alignment 1; impact fee revenues are discussed separately below. As shown, the CFD results in slightly higher revenues than the IFD. The special assessment district is expected to generate significantly lower revenues than either the CFD or IFD, because assessment districts may only be used to pay for the portion of an improvement that provides a direct "special benefit" (as distinct from general, community-wide benefits) to property owners. In general, the higher intensity land use scenarios result in higher revenues.

Figure 3. Total Estimated Financing District Revenues: Alignment 1, 2017-2047 (in 2014 Dollars)



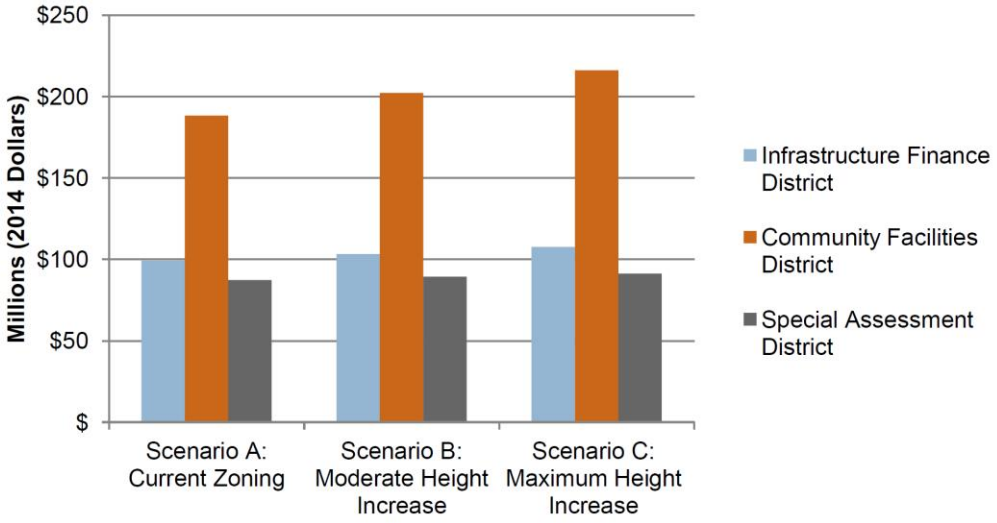
Source: Strategic Economics, 2014.

- **Of the three mechanisms, the CFD is expected to support the highest bond proceeds and is therefore likely to pay for the largest share of the project, about 10 to 22 percent of total project costs.** Figure 4 shows the estimated bonding capacity of the various financing tools for Alignment 1. The CFD could support bond proceeds of approximately $190 to $215 million, an amount sufficient to fund approximately 10 to 22 percent of the Alignment 1 construction costs (which are currently estimated at roughly $1 to $2 billion). The IFD is expected to support significantly lower bond proceeds, in the range of $99 to $107 million or approximately 5 to 11 percent of project costs. The special assessment district would support an $87 to $91 million bond, sufficient to fund 4 to 8 percent of Alignment 1 construction costs.
- **New development is expected to contribute approximately 10 to 35 percent of the total financing capacity, depending on the funding mechanism and land use scenario.** Figure 5 shows the share of total bonding capacity associated with new development under each land use scenario for the three different types of financing districts. New development accounts for the highest share of total financing capacity in the CFD, reflecting the assumption that new development would pay a higher CFD special tax rate than new development. CFDs provide the flexibility to set different special tax rates for different parcels within the CFD boundary; in practice, different rates could be set based on land use, distance from the transit stations, which parcels are upzoned, or other reasonable criteria. Alternatively, multiple CFDs could be

established, charging different rates on different parcels. However, because the development projections were not parcel-specific, it was assumed for the purpose of this simplified analysis that new development would pay a higher special tax rate than existing development. This assumption was intended to approximate the effect of charging higher special tax rates to properties that would most likely be upzoned, since the majority of development opportunity is on those sites.

- **The significant difference in bonding capacity between the IFD and CFD reflects differences in the revenue flows for the respective tools.** Both tools generate a similar amount of total revenue over a 30-year period. However, the IFD revenues accrue slowly in the early years, increasing in later years as the size of the tax increment grows.[8] In contrast, the revenues from the CFD are more consistent over time, resulting in a greater capacity for financing upfront capital improvements. Figure 6 shows the annual revenue stream for the various types of financing districts, using Alignment 1, Scenario C as an example. The bonding capacity estimates are also affected by differences in the bond financing assumptions; because IFDs are an untested tool with which investors are unfamiliar, the interest rates for the first several IFDs issued in the state are anticipated to be higher than current interest rates for more established types of financing districts.[9]

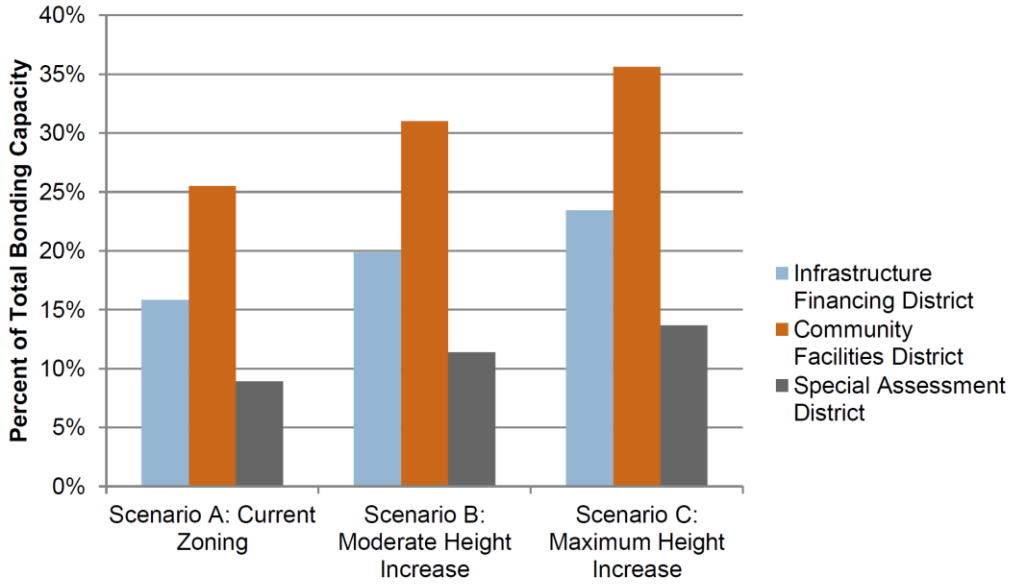
Figure 4. Estimated Bonding Capacity: Alignment 1 (in 2017 Dollars)



Source: Strategic Economics, 2014.

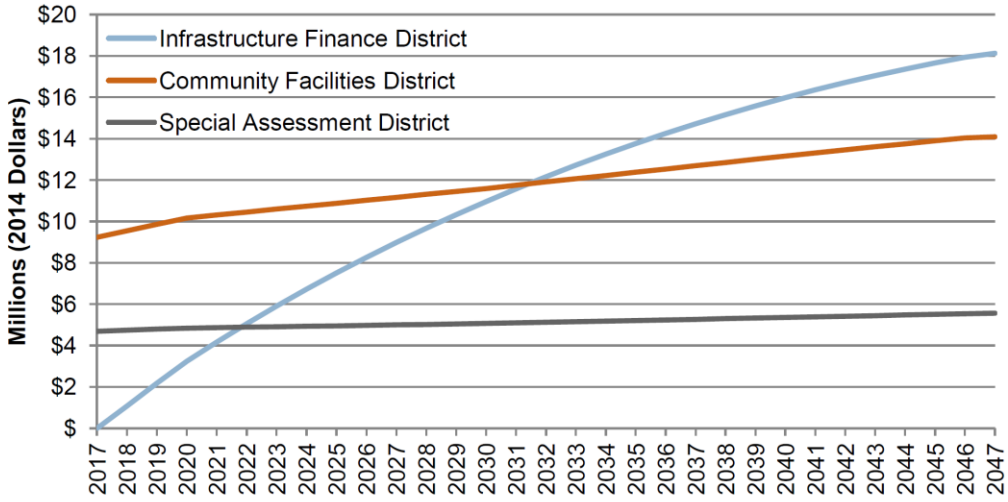
[8] Note that the bonding capacity of the IFD could be somewhat increased by increasing the share of the tax increment that flows to the IFD in early years. The Board of Supervisor's Policy Guidelines for IFDs allows for this type of "front-loading" of increment. Since front-loading the increment would require a policy decision by the Board, this analysis assumed that the share of increment captured by the IFD remains steady over time. See the "Methodology & Key Assumptions" section for further discussion of the assumptions used to project revenues.
[9] See the "Methodology & Key Assumptions" section for further discussion of bond financing assumptions.

Figure 5. Share of Total Bonding Capacity Associated with New Development: Alignment 1



Source: Strategic Economics, 2014.

Figure 6. Annual Financing District Revenues: Alignment 1, Scenario C, 2017-2047 (in 2014 Dollars)



Source: Strategic Economics, 2014.

- **An IFD could potentially be combined with a CFD, special assessment district, or a new impact fee to leverage funds.** Because IFDs divert part of the existing property tax rate rather than creating additional taxes or fees for property owners, they have the potential to be combined with other tools such as a CFD, special assessment district, or additional impact fee. Combining multiple tools that create new taxes or fees (such as CFDs and special assessment districts) may be more challenging because property owners would essentially be charged twice for the same transit improvement.

- **Each of the financing district tools have particular requirements that present challenges for financing a major transit project in an infill context.** IFDs and CFDs require approval by a two-thirds majority of voters if more than 12 registered voters live within the boundaries of the proposed district. If fewer than 12 voters live within the boundary, two-thirds approval by property owners in the district is required. As a result of these and other restrictions, IFDs were rarely used for any purpose before California eliminated redevelopment tax-increment financing (TIF) in 2011; San Francisco's Rincon Hill IFD is one of the only IFDs that has been established to date. CFDs are much more common, but are typically used to finance improvements in places with a small number of property owners who intend to develop or redevelop their land and/or subdivide it for sale. Given the large number of residents in the station areas, the IFD and CFD modeled in this analysis would require approval by two-thirds of registered voters. While there are some limited examples of CFDs that include large numbers of property owners and voters – including a CFD that voters in downtown Los Angeles approved in 2012 in order to fund the development of a downtown streetcar – such districts are unusual and may require significant community outreach in order to build support among both voters and the property owners who will ultimately pay the special tax.[10]

  Special assessment districts only require approval by a simple majority of property owners. However, under Proposition 218, an amendment to the California constitution passed in 1996, assessment revenues may only be used to pay for the portion of an improvement that provides a direct "special benefit" to the property owners paying the assessment. There are no known examples of special assessment districts that have been created in order to pay for large-scale transit capital projects in California since Proposition 218 was passed.

- **New development in the Alignment 1 station areas could generate up to $23 million in Transportation Sustainability Fee revenues over the time horizon of the study.** These revenues would flow into a citywide fund that will pay for projects throughout San Francisco that are eligible for the TSF Expenditure Plan. A Central Subway extension is expected to qualify as an eligible project, but TSF revenues generated in this area would not be tied to this specific project, and TSF revenues generated elsewhere in the City could be used here.

- **In general, the results for Alignment 2A are similar to the results for Alignment 1, while Alignment 2B would serve a larger land area and is therefore associated with higher revenue projections (as well as higher expected construction costs) compared to Alignments 1 and 2A.** However as a percentage of total estimated maximum project cost, revenues for Alignments 1 and 2A perform slightly better, reflecting the lower construction costs associated with these scenarios. See Figures 7 through 9 for the complete results for all three alignments.

[10] Although approval by voters (including many renters) would be needed to implement a special tax in a highly populated urban area, concerted opposition from property owners could significantly undermine voter support. On the other hand, in districts where many renters would be voting, it may be possible to pass a higher special tax.

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Figure 7. Projected Assessed Values and Value Capture Revenues: Alignment 1 (Washington Square/Conrad Square)

	Scenario A: Current Zoning	Scenario B: Moderate Height Increase	Scenario C: Maximum Height Increase
Total Assessed Value (2014 Dollars)[a]			
Existing	$2,319,287,000	$2,319,287,000	$2,319,287,000
Projected, 2047	$7,352,012,000	$7,648,341,000	$7,971,835,000
Percent Increase	217%	230%	244%
Infrastructure Finance District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$317,156,000	$330,268,000	$344,474,000
Estimated Bonding Capacity (2017 Dollars)[b]	$99,333,000	$103,303,000	$107,582,000
Bonding Capacity as % of Project Costs			
Low ($1 billion project)	10%	10%	11%
High ($2 billion project)	5%	5%	5%
Community Facilities District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$318,968,000	$344,062,000	$369,068,000
Estimated Bonding Capacity (2017 Dollars)[c]	$188,337,000	$202,201,000	$216,018,000
Bonding Capacity as % of Project Costs			
Low ($1 billion project)	19%	20%	22%
High ($2 billion project)	9%	10%	11%
Special Assessment District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$151,924,000	$155,664,000	$159,367,000
Estimated Bonding Capacity (2017 Dollars)[d]	$87,379,000	$89,357,000	$91,314,000
Bonding Capacity as % of Project Costs			
Low ($1 billion project)	9%	9%	9%
High ($2 billion project)	4%	4%	5%
Transit Sustainability Fee			
Total Revenues, 2015-2047 (2014 Dollars)[a]	$14,632,000	$19,093,000	$23,429,000
% of Project Costs			
Low ($1 billion project)	N/A[e]	N/A[e]	N/A[e]
High ($2 billion project)	N/A[e]	N/A[e]	N/A[e]

Estimates are rounded to the nearest thousand.
(a) Assumes 2.5% annual inflation rate.
(b) Assumes 120% debt service coverage ratio, 8% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(c) Assumes 120% debt service coverage ratio, 4.75% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(d) Assumes 120% debt service coverage ratio, 5% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(e) Not applicable; TSF revenues are not tied to specific projects; revenues will flow into citywide fund and used to pay for eligible projects throughout San Francisco.
Source: Strategic Economics, 2014.

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Figure 8. Projected Assessed Values and Value Capture Revenues: Alignment 2A (Washington Square/Kirkland Yard)

	Scenario A: Current Zoning	Scenario B: Moderate Height Increase	Scenario C: Maximum Height Increase
Total Assessed Value (2014 Dollars)[a]			
Existing	$2,053,714,000	$2,053,714,000	$2,053,714,000
Projected, 2047	$7,112,030,000	$7,298,821,000	$7,949,575,000
Percent Increase	246%	255%	287%
Infrastructure Finance District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$310,955,000	$319,142,000	$347,763,000
Estimated Bonding Capacity (2017 Dollars)[b]	$97,434,000	$99,896,000	$108,524,000
Bonding Capacity as % of Project Costs			
Low ($1 billion project)	10%	10%	11%
High ($2 billion project)	5%	5%	5%
Community Facilities District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$313,217,000	$327,158,000	$380,525,000
Estimated Bonding Capacity (2017 Dollars)[c]	$184,571,000	$192,273,000	$221,753,000
Bonding Capacity as % of Project Costs			
Low ($1 billion project)	18%	19%	22%
High ($2 billion project)	9%	10%	11%
Special Assessment District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$143,444,000	$145,665,000	$151,932,000
Estimated Bonding Capacity (2017 Dollars)[d]	$82,475,000	$83,649,000	$86,968,000
Bonding Capacity as % of Project Costs			
Low ($1 billion project)	8%	8%	9%
High ($2 billion project)	4%	4%	4%
Transit Sustainability Fee			
Total Revenues, 2015-2047 (2014 Dollars)[a]	$15,653,000	$18,019,000	$27,497,000
% of Project Costs			
Low ($1 billion project)	N/A[e]	N/A[e]	N/A[e]
High ($2 billion project)	N/A[e]	N/A[e]	N/A[e]

Estimates are rounded to the nearest thousand.
(a) Assumes 2.5% annual inflation rate.
(b) Assumes 120% debt service coverage ratio, 8% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(c) Assumes 120% debt service coverage ratio, 4.75% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(d) Assumes 120% debt service coverage ratio, 5% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(e) Not applicable; TSF revenues are not tied to specific projects; revenues will flow into citywide fund and used to pay for eligible projects throughout San Francisco.
Source: Strategic Economics, 2014.

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Figure 9. Projected Assessed Values and Value Capture Revenues: Alignment 2B (Washington Square/Kirkland Yard/Conrad Square)

	Scenario A: Current Zoning	Scenario B: Moderate Height Increase	Scenario C: Maximum Height Increase
Total Assessed Value (2014 Dollars)[a]			
Existing, 2014	$2,871,917,000	$2,871,917,000	$2,871,917,000
Projected, 2047	$8,998,773,000	$9,342,171,000	$10,099,456,000
Percent Increase	213%	225%	252%
Infrastructure Finance District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$387,422,000	$402,593,000	$435,875,000
Estimated Bonding Capacity (2017 Dollars)[b]	$121,341,000	$125,927,000	$135,954,000
Bonding Capacity as % of Project Costs			
Low ($1.5 billion project)	8%	8%	9%
High ($2.5 billion project)	5%	5%	5%
Community Facilities District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$393,099,000	$421,510,000	$482,603,000
Estimated Bonding Capacity (2017 Dollars)[c]	$232,013,000	$247,707,000	$281,457,000
Bonding Capacity as % of Project Costs			
Low ($1.5 billion project)	15%	17%	19%
High ($2.5 billion project)	9%	10%	11%
Special Assessment District			
Total Revenues, 2017-2047 (2014 Dollars)[a]	$188,088,000	$192,371,000	$199,943,000
Estimated Bonding Capacity (2017 Dollars)[d]	$108,213,000	$110,478,000	$114,486,000
Bonding Capacity as % of Project Costs			
Low ($1.5 billion project)	7%	7%	8%
High ($2.5 billion project)	4%	4%	5%
Transit Sustainability Fee			
Total Revenues, 2015-2047 (2014 Dollars)[a]	$18,373,000	$23,363,000	$34,134,000
% of Project Costs			
Low ($1.5 billion project)	N/A[e]	N/A[e]	N/A[e]
High ($2.5 billion project)	N/A[e]	N/A[e]	N/A[e]

Estimates are rounded to the nearest thousand.
(a) Assumes 2.5% annual inflation rate.
(b) Assumes 120% debt service coverage ratio, 8% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(c) Assumes 120% debt service coverage ratio, 4.75% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(d) Assumes 120% debt service coverage ratio, 5% annual interest rate, and 5% issuance cost; bond is issued in 2017.
(e) Not applicable; TSF revenues are not tied to specific projects; revenues will flow into citywide fund and used to pay for eligible projects throughout San Francisco.
Source: Strategic Economics, 2014.

APPENDIX A. OVERVIEW OF VALUE CAPTURE MECHANISMS

In order to determine which value capture tools have the greatest potential to contribute to the Central Subway extension, Strategic Economics reviewed the full range of value capture mechanisms available to the City and County of San Francisco. Figure A-1 summarizes the available mechanisms, including descriptions of various aspects of each tool such as the revenue source, the permitted use of funds, and whether the tool requires the City to establish a "nexus" (or reasonable relationship) between the entities paying the fee, the amount they pay, and the benefit they receive.

Infrastructure Finance Districts, Mello-Roos Community Facilities Districts (CFDs), special assessment districts, and development impact fees have the greatest potential to help fund the construction of the Central Subway extension. The remaining tools shown in Figure A-1 are unlikely to be applicable to the Central Subway extension. In the case of Community Benefit Districts (CBDs) and Property and Business Improvement Districts (PBIDs) – which are types of special assessment districts – another variety of special assessment district is more likely to be appropriate for a large-scale transit improvement.[11] Similarly, parcel taxes present no clear advantage over CFDs, which are more typically used for local infrastructure projects. Since there is limited vacant or underutilized City-owned land within close proximity of the proposed Central Subway stations, it is also unlikely that the sale or ground lease of public land or a property transfer fee could contribute in a substantial way to the project.

IFDs, CFDs, special assessment districts, and development impacts fees – the types of mechanisms with the greatest potential to help finance the Central Subway extension – are described in detail below:

- **Infrastructure Finance Districts (IFDs)** divert new property tax revenues (the "increment") to pay for the construction of infrastructure and public facility improvements. The revenues may be used to fund the construction of infrastructure and public facility improvements on a pay-as-you-go basis, or to issue bonds to finance those improvements. IFD boundaries can be drawn to include non-contiguous parcels. Under current state law, IFDs may be approved by a two-thirds majority of property owners (weighted by property area) in the proposed district, so long as there are no more than 12 registered voters living within the proposed boundary. If there are more than 12 registered voters living within the boundary, two-thirds approval by voters living within the district is required. In addition to voter or property owner approval, IFDs require approval by all affected tax entities, and cannot capture property tax revenues that would otherwise go to school districts or community colleges. The state is considering legislation that could make IFDs easier to use, including reducing the voter threshold to 55 percent.

  IFDs have not been widely used in California to date, in large part because redevelopment tax-increment financing (TIF) served as a more viable alternative prior to the elimination of redevelopment by the State of California in 2011. However, San Francisco began exploring the use of IFDs even before the end of redevelopment, and has established a policy to guide the use of IFDs as well as one of the first IFDs in the state, in the Rincon Hill neighborhood. Although there are no examples to date of an IFD being used to fund transit facilities, this use is permitted under state statute.

- **Mello-Roos Community Facilities Districts (CFDs)** are a type of special taxing district formed when registered voters or property owners within a geographic area agree to impose a new tax on

[11] The City of Emeryville uses a PBID to pay for the Emery-Go-Round shuttle; however, the PBID pays primarily for operating costs.

property in order to fund infrastructure improvements, the development of public facilities, or ongoing maintenance, repair, or services. Tax revenues can then be saved in a fund for use on a pay-as-you-go basis, or used to issue a bond. CFDs are relatively flexible, and the special tax rates may be set on any reasonable basis determined by the local legislative body (e.g., on the basis of building area, parcel size, or linear feet of parcel frontage), except that the tax cannot be *ad valorem* (based on property value). CFD boundaries can be drawn to include non-contiguous parcels, and different special tax rates can be set for different parcels within the CFD, based on land use/property type, distance from a transit station, which parcels are upzoned, densities, or other material factors. Like an IFD, a CFD requires approval by two-thirds of property owners (weighted by property area) so long as there are no more than 12 registered voters living within the proposed boundary. If there are more than 12 registered voters living within the district, the formation of a CFD requires two-thirds voter approval.

Because of this voter approval requirement, CFDs are most commonly formed in undeveloped areas where the district encompasses a single property owner or a small number of property owners who intend to develop the property and/or subdivide the land for sale. (One provision of the Mello-Roos Community Facilities District Act is that the fees can be proportionally subdivided with the land and passed on to the future owners.) Recent examples in San Francisco include the Mint Plaza CFD and the Transbay Transit Center CFD, [12] both of which include a limited number of properties that were slated for redevelopment and/or subdivision, but at the time of formation had fewer than 12 registered voters. While there are some limited examples of CFDs that include numerous property owners – including a CFD that voters in downtown Los Angeles approved in 2012 in order to fund the development of a downtown streetcar – such districts are unusual and may require significant community outreach in order to build support among both voters and the property owners who will pay the special tax. Although approval by voters (including many renters) would be needed to implement a special tax in a highly populated urban area, concerted opposition from property owners could significantly undermine voter support. On the other hand, it may be possible to pass a higher special tax in districts where many renters are voting.

- **Special assessment districts** are designated districts where property owners agree to pay an additional assessment in order to fund specific improvements or services. Assessment districts are established by a vote of the property owners and require support from owners of a simple majority (50 percent plus one) of assessed property value in the district. However, under Proposition 218, a constitutional amendment passed by California voters in 1996, the amount that each property owner pays must be directly proportional to the "special benefit" the property will receive from the proposed improvement. The assessment district may not be used to pay for the portion of an improvement that accrues to the community at large (known as the "general benefit"). California law defines a number of different types of assessment districts (e.g., Lighting and Landscaping Districts, Parking Districts, Property and Business Improvement Districts), most of which can issue tax-exempt bonds.

  As a result of the special benefit requirement, assessment districts are typically used to fund small, primarily local-serving infrastructure such as landscaping, lighting, street, or sidewalk improvements. The Municipal Improvement Act of 1913 specifies that local governments may use special assessment districts to pay for public transit facilities (including stations, rolling stock and other equipment, and land acquisition) "designed to serve an area of not to exceed three

[12] Note that the Transbay Transit Center CFD is still in the process of formation. As proposed, the Transit Center CFD could help finance a variety of transit improvements, including the purchase of new transit vehicles, enhanced capacity at Embarcadero and Montgomery BART stations, the extension of Caltrain rail tracks to the Transit Center, and an underground pedestrian tunnel connecting the Transit Center with the Embarcadero BART/Muni Metro Station.

square miles."[13] In addition, the state enacted a bill in 2013 (Senate Bill 142) that authorizes municipal transit operators and other transit agencies to create special benefit districts in order to fund the development of transit stations and rail facilities. However, Strategic Economics has not identified any examples of special assessment districts that have been created in order to pay for transit facilities in California since Proposition 218 was passed in 1996.

- **Development impact fees:** Development impact fees are a one-time charge to new development imposed under California's Mitigation Fee Act. These fees are charged to mitigate impacts resulting from development activity, and cannot be used to fund existing infrastructure deficiencies (i.e., repair or maintenance of existing infrastructure). In other words, for improvements that benefit existing as well as new development, impact fees can only pay for the portion of the improvement that benefits the new uses. Cities must find other funding sources to cover the costs that benefit existing uses. Impact fees do not require voter or property owner approval, but must be adopted based on findings of a "nexus" (or reasonable relationship) between the development paying the fee, the size of the fee, and the use of fee revenues. Because impact fees are dependent on new development projects, they are not usually consistent or predictable enough to serve as security for the issuance of bonds.

  San Francisco currently has a variety of transit-related impact fees in place, including the Transit Impact Development Fee (TIDF) on new commercial uses and various Community Infrastructure Impact Fees in some local plan areas (e.g., Eastern Neighborhoods, Market and Octavia). The City is currently in the process of implementing a citywide Transportation Sustainability Fee (TSF) that would apply to residential as well as commercial land uses, and replace or serve as a credit against existing transit-related impact fees. Fee revenues would fund a $1.4 billion expenditure program over 20 years. The Central Subway extension would likely be eligible for the TSF Expenditure Plan. However, TSF revenues are not tied to specific projects or geographic areas; revenues will flow into a citywide fund and be used to pay for eligible projects throughout San Francisco.

[13] State of California, Streets and Highways Code, Section 10100.5.

Figure A-1. Overview of Value Capture Mechanisms

Mechanisms in bold have the greatest potential to help fund the construction of the Central Subway extension.

Mechanism	Geographic Scale at Which Tool Can Be Applied	Revenue Source	Voting Requirements	Permitted Uses of Funds	Nexus Requirement?[(a)]	Duration of Revenue Stream	Potential for Bond Financing	Precedents[(b)]	Applicable to Central Subway Extension?
Infrastructure Finance District (IFD)	District	Future increases in revenues from the existing property tax (tax increment)	2/3 of property owners or registered voters[(d)]	Construction or acquisition of public facilities and infrastructure, including transit facilities. May not fund routine operations or maintenance or, except in limited cases, affordable housing or economic development projects.	No	Ongoing; up to 30 years	Yes	No known precedents for transit projects	Likely
Mello-Roos Community Facilities District (CFD)	District	Special tax on property	2/3 of property owners or registered voters[(d)]	Construction or acquisition of public facilities (e.g., parks, schools, libraries, transit). May also fund some ongoing services (e.g., fire, police, lighting and maintenance of roads, landscaping, open space).	No	Ongoing; flexible duration	Yes	Los Angeles Streetcar CFD Transbay Transit Center CFD in San Francisco	Likely
Special Assessment District	District or citywide	Assessment, usually of property	50% plus one of property owners (weighted by financial obligation of each property under proposed assessment)	Uses are specified in various assessment acts. The Municipal Improvement Act of 1913 and Senate Bill 142 (enacted in 2013) allow for assessments to fund public transit facilities.	Size of assessment must be proportional to benefits received by property owners; uses must directly benefit assessees	Ongoing; term varies by type of district	Yes	No known precedents for transit capital projects (see discussion of Emeryville PBID below)	Likely
Community Benefit Districts and Property & Business Improvement Districts (CBDs/PBIDs)[(c)]	District	Assessment of business licenses or property	50% plus one of property or business owners (weighted by financial obligation of each property or business under proposed assessment)	Districts may provide services that include safety, maintenance, marketing, capital improvements, economic development, and special events.	Size of assessment must be proportional to benefits received by business or property owners; uses must directly benefit assessees	Ongoing; districts that issue bonds may have a term of up to 40 years. All other districts may last up to 15 years (and may be subsequently renewed)	Yes	Emeryville PBID pays for operation of the Emery-Go-Round shuttle; no known precedents for transit capital projects	Unlikely; another type of Special Assessment District is more likely to be appropriate for this type of capital improvement
Development Impact Fee	District or citywide	One-time fee on new development	None	Funds may only be used to mitigate impacts caused by new development, including impacts on transit system.	Requires reasonable relationship ("nexus") between the development paying the fee, the size of the fee, and the use of fee revenues	Ongoing but unpredictable.	No	San Francisco has an existing Transit Impact Development Fee (TIDF), and is in the process of establishing a citywide Transportation Sustainability Fee (TSF) to offset the cumulative impacts of development on the City's transportation network	Project would likely be eligible for the TSF Expenditure Plan, however funds generated in the vicinity of the Central Subway cannot be specifically dedicated to the project
Parcel Tax	District or citywide	Special tax on property	2/3 of registered voters	Flexible; typically pays for local government services that benefit the community at large. Most commonly used for schools but have been used to fund transit.	No	Ongoing	Yes	AC Transit's operations are partially funded by a parcel tax; no known precedents for transit capital projects	Unlikely; CFDs are more typically used for this type of project and parcel taxes present no clear advantage over a CFD
Sale or Ground Lease of Public Land	Development site	Sale or ground lease of publicly owned land for new development	None	Negotiable	No	One-time sale or ongoing ground lease; duration of ground lease depends on terms of negotiation.	No	West Dublin/Pleasanton BART Station was partially funded through sale and ground lease of BART-owned properties	Unlikely; limited City-owned land in station areas
Property Transfer Fees/Benefit Covenant	Development site	Fee on future sales of new units in development on land sold by a public agency	None	Negotiable	No	Depends on terms of negotiation	No	West Dublin/Pleasanton BART Station	Unlikely; limited City-owned land in station areas

(a) Requirement for a "nexus" (or reasonable relationship) between the entities paying the fee, the amount they pay, and the benefit they receive.
(b) Examples of transit-related projects in California funded with given tools.
(c) Type of special assessment district; CBDs are authorized under San Francisco law.
(d) CFDs and IFDs may be approved by a two-thirds majority of property owners in the proposed district, so long as there are no more than 12 registered voters living within the proposed boundary. If there are more than 12 registered voters living within the boundary, two-thirds approval by voters living within the district is required.
Source: Strategic Economics, 2014.

APPENDIX B. METHODOLOGY & KEY ASSUMPTIONS

This section provides a detailed discussion of the methodology and key assumptions used in the analysis, including the methodology for projecting future development, estimating assessed property values, and estimating revenues and bonding capacity for the value capture mechanisms tested.

Projecting Development

Strategic Economics projected new residential, hotel, retail, and office development within a quarter-mile of the proposed Central Subway extension stations (the "station areas") using the methodology described below. Figure B-1 summarizes the development projections for the three alignments and land use scenarios.

- **Existing building area:** Total existing (2014) building area in the station areas by land use was estimated based on data from the San Francisco Office of the Assessor-Recorder.
- **Maximum development capacity ("soft site" analysis):** There are few vacant properties in the station areas, so most development is likely to take the form of redeveloping low-intensity, outdated buildings with higher-intensity uses. The Planning Department identified parcels that are under-developed relative to their total potential capacity – known as "soft sites" – under the zoning and height regulations in each land scenario. For the purposes of this analysis, soft sites were defined as sites that are currently developed to less than 40 percent of their total capacity under the zoning and height regulations in each respective scenario.[14] For example, a parcel that could accommodate a 30,000 square foot building under existing zoning, but is currently occupied by a 10,000 square foot building, would be considered a soft site under Scenario A because it is developed at 33 percent of its total capacity.
- **Absorption:** The station areas are assumed to capture a share of the citywide household and employment growth projected by the Association of Bay Area Governments and Metropolitan Transportation Commission for *Plan Bay Area*.[15] All three scenarios include new development beginning in 2015, in advance of any revisions to land use or zoning regulations (which would likely take at least two years to complete). Projected households and employment were translated to square feet of new development using standard assumptions about housing unit size and employment density,[16] with the total amount of development by 2047 capped at the maximum development capacity calculated in the soft site analysis (although as shown in Figure B-1, projected development fell slightly short of this cap).

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[14] Note that the Planning Department typically defines soft sites as properties that are developed to less than 30 percent of total capacity. However, a more aggressive cut-off of 40 percent was used for this analysis because of the long time horizon of the study, the limited number of soft sites in the station areas, and the fact that several large sites fall just above the typical 30 percent cutoff.

[15] Under Scenario A (current zoning), the three station areas were assumed to capture 1.0 percent of citywide household growth and 1.3 percent of citywide employment growth per year, based on historic population and employment trends in the Fisherman's Wharf/North Beach area. This growth was allocated among the station areas, and scaled up proportionally for Scenarios B and D, based on based on total development capacity from the soft site analysis. This methodology resulted in the station areas capturing between 0.8% and 1.5% of citywide household growth and between1.0% and 2.4% of citywide employment growth, depending on the alignment and land use scenario.

[16] Residential units were assumed to be 850 square feet (net) on average. Employment density assumptions included the following: 500 square feet per retail job, 200 square feet per office job, and 1.5 employees per 700 square-foot hotel room (467 square feet per hotel job).

- **Land use mix of new development:** New development was assumed to reflect the approximate land use mix in the Kirkland Yard and Conrad Square (where the majority of soft sites are located): 40 percent residential, 30 percent hotel, 15 percent retail, and 15 percent office, by building area. Of the residential development, 80 percent was assumed to be rental apartments and 20 percent was assumed to be for-sale condominiums, based on the existing mix of renters and owners in the Fisherman's Wharf/North Beach area according to the 2010 U.S. Decennial Census.
- **Redevelopment:** In order to account for redevelopment of existing buildings, the analysis incorporated assumptions about the number of square feet of existing building area that would be redeveloped for every square foot of new development built, based on the existing building square footage on the "soft sites" identified by the Planning Department's building capacity analysis.

Figure B-1. Summary of Land Use Scenarios (Thousands of Square Feet)

	Scenario A	Scenario B	Scenario C
Alignment 1 - Washington Square/Conrad Square Station Areas[a]			
Existing Development, 2014[b]	8,997	8,997	8,997
Maximum Development Capacity[c]	1,662	2,169	2,661
Total New Development, 2015-2047[d]	1,467	1,915	2,349
Redevelopment, 2015-2047[e]	-271	-361	-410
Total (Net) Building Area, 2047[f]	10,193	10,550	10,936
Alignment 2A - Washington Square/Kirkland Yard Station Areas[a]			
Existing Development, 2014[b]	8,585	8,585	8,585
Maximum Development Capacity[c]	1,812	2,086	3,183
Total New Development, 2015-2047[d]	1,577	1,816	2,771
Redevelopment, 2015-2047[e]	-347	-359	-607
Total (Net) Building Area, 2047[f]	9,815	10,042	10,748
Alignment 2B - Washington Square/Kirkland Yard/Conrad Square Station Areas[a]			
Existing Development, 2014[b]	11,046	11,046	11,046
Maximum Development Capacity[c]	2,127	2,705	3,952
Total New Development, 2015-2047[d]	1,851	2,354	3,440
Redevelopment, 2015-2047[e]	-403	-492	-740
Total (Net) Building Area, 2047[f]	12,494	12,908	13,745

(a) Includes all properties within a quarter-mile of the stations proposed for each alignment.
(b) Estimated based on parcel data from the San Francisco Office of the Assessor-Recorder.
(c) From soft site analysis conducted by San Francisco Planning Department; based on maximum capacity of sites that are currently developed to less than 40 percent of their total capacity under the zoning and height regulations in each respective scenario.
(d) Assumes that the station areas capture between 0.8% and 1.5% of citywide household growth and between 1.0% and 2.4% of citywide employment growth projected by ABAG and MTC in Plan Bay Area, depending on the given alignment and land use scenario.
(e) Number of square feet of existing building area that would be redeveloped, based on the existing building square footage on the "soft sites" identified by the Planning Department's building capacity analysis.
(f) Existing development plus total new development, net of redeveloped building area.
Source: Strategic Economics, 2014.

Projecting Assessed Property Values

Current (2014) assessed values were calculated based on data from the San Francisco Office of the Assessor-Recorder. Under California's Proposition 13, properties are reassessed to market value upon sale or when major construction occurs; otherwise, assessed values may only increase at the rate of inflation, not to exceed two percent per year. Accordingly, assessed values in future years were projected using the following assumptions:

- **Market Values:** The current market value of existing and new apartments, retail, and office space was estimated using an income capitalization approach, in which the expected net rental income is divided by a capitalization rate to obtain a value per square foot. These calculations and the underlying assumptions are shown in Figures B-2 and B-3. Note that office and retail rents in the Fisherman's Wharf/North Beach area are generally comparable, reflecting the fact that the district is a particularly high-value location for retail. Average condominium sales prices (shown in Figure B-2) were estimated based on recent transactions and published reports. Hotel valuations (shown in Figure B-4) were derived from reports of recent hotel sales and estimated hotel construction costs in the area. Figures B-2 through B-4 show current (2014) market values; in the following years, values are assumed to appreciate at an average annual rate of 4 percent for residential values and 3 percent for commercial values.[17]
- **Transit Premium:** Market values are projected to experience a one-time increase of 5 percent in 2019, the year before transit service begins. Five percent is a conservative estimate of the property value premium conferred by proximity to a new transit investment, based on a review of recent literature.[18] Although estimates of this transit price premium vary widely from study to study, most studies have found premiums in the range of 5 to 15 percent for properties located within a quarter- to half-mile of a transit station.[19]
- **Assessed Values:** Properties were assumed to be reassessed to market value when either 1) new development occurs or 2) properties are sold.[20] Otherwise, assessed values were assumed to increase two percent per year (beginning in the year after construction for new development) to represent the inflationary increase permitted under Proposition 13.

[17] These appreciation rates are significantly lower than the rate at which prices have increased in San Francisco in recent years, but are intended to reflect average appreciation over a 30+ year time period which will likely include recessions as well as periods of growth.

[18] See for example Wardrip, *Public Transit's Impact on Housing Costs: A Review of the Literature*; Ghebreegziabiher Debrezion, Eric Pels, and Piet Rietveld, "The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-Analysis," *Journal of Real Estate Finance and Economics* 35, no. 2 (June 2007): 161–80; Michael Duncan, "Comparing Rail Transit Capitalization Benefits for Single-Family and Condominium Units in San Diego, California," *Transportation Research Record: Journal of the Transportation Research Board* 2067 (December 1, 2008): 120–30.

[19] Note that the majority of studies have focused on residential development, with most of those focused on single-family homes. However, several studies have also found that commercial properties experience a premium associated with proximity to transit; for example see Weinberger, "Light Rail Proximity"; Debrezion, Pels, and Rietveld, "The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-Analysis"; Ko and Cao, *Impacts of the Hiawatha Light Rail Line on Commercial and Industrial Property Values in Minneapolis*.

[20] Properties were assumed to turn over once every 7 years for condominiums and once every 15 years for commercial development (including apartments), based on standard industry assumptions.

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Figure B-2. Residential Market Valuation, 2014

	Unit	New	Existing
Apartments			
Assumptions			
Monthly Rent	per unit	$3,800	$3,500
Vacancy	percent	5.0%	5.0%
Non-Reimbursable Expenses	percent	25.0%	25.0%
Capitalization Rate	percent	5.0%	5.0%
Estimated Value			
Gross Annual Income	per unit	$45,600	$42,000
Less Vacancy	per unit	-$2,280	-$2,100
Less Non-Reimbursable Exp.	per unit	-$11,400	-$10,500
Net Operating Income	per unit	$31,920	$29,400
Capitalized Value	per unit	$638,400	$588,000
Condominiums			
Sales Price	per unit	$885,000	$854,000
Average Value (a)	per unit	$690,407	$644,098
	per sq. ft.	**$812**	**$758**

(a) Assumes 80 percent rental apartments and 20 percent for-sale condominiums, based on the existing mix of renters and owners in the Fisherman's Wharf/North Beach area.
Sources: Real Facts, 2Q 2014; Rent Jungle, June 2014; Polaris Pacific San Francisco Market Report, June 2014; Zillow.com, July 2014; Strategic Economics, 2014.

Figure B-3. Retail and Office Market Valuation, 2014

		Retail (NNN)		Office (Full Service)	
	Unit	New	Existing	New	Existing
Assumptions					
Monthly Rent	per sq. ft.	$4.25	$3.80	$4.25	$3.80
Vacancy	percent	5.0%	5.0%	8.0%	8.0%
Non-Reimbursable Expenses	percent	5.0%	5.0%	25.0%	25.0%
Capitalization Rate	percent	5.5%	5.5%	4.5%	4.5%
Estimated Value					
Gross Annual Rent Income	per sq. ft.	$51.00	$45.60	$51.00	$45.60
Less Vacancy	per sq. ft.	-$2.55	-$2.28	-$4.08	-$3.65
Less Non-Reimbursable Exp	per sq. ft.	-$2.55	-$2.28	-$12.75	-$11.40
Net Operating Income	per sq. ft.	$45.90	$41.04	$34.17	$30.55
Capitalized Value	**per sq. ft.**	**$835**	**$746**	**$759**	**$679**

NNN: Triple Net. In a triple net lease, the tenant pays for property taxes, building insurance, and maintenance; in a full service lease, the landlord pays for these expenses.
Sources: CoStar, July 2014; LoopNet, July 2014; CBRE, Q2 2014; Strategic Economics, 2014.

Figure B-4. Hotel Market Valuation, 2014

	Unit	New	Existing
Average Sq. Ft. per Room (Gross)	sq. ft.	700	700
Value	per room	$450,000	$371,800
	per sq.ft.	**$643**	**$531**

Sources: San Francisco Business Times, June 2012 and December 2013; Strategic Economics, 2014.

Estimating Value Capture Revenues & Bonding Capacity

Revenues from the value capture mechanisms were estimated using the following assumptions and methodology:

- **IFD revenues:** The IFD calculation assumes the IFD will be funded solely by capturing a share of the incremental property tax revenues that would otherwise flow to the City and County General Fund. In San Francisco, the City and County General Fund receives $0.566 for every $100 in assessed value. Incremental General Fund property tax revenues were calculated by applying the 0.566 percent rate to the incremental assessed value in each year, defined as the difference between the assessed value in any given year and the assessed value in the base year (2017). The IFD captures 50 percent of the General Fund tax increment generated between 2017 and 2047 from all properties located within a quarter-mile of the stations. This is consistent with the Board of Supervisor's IFD Policy Guidelines, which states that the maximum increment available to an IFD "may be increased to 50% to fund neighborhood infrastructure that also provides clear citywide benefits, like an extension or upgrade of a MUNI light rail line…."[21]

- **CFD revenues:** The CFD calculation assumes that all properties within a quarter-mile of the stations will pay a special tax, beginning in 2017 at the average per-square-foot rates shown in Figure B-5. After 2017, CFD rates are assumed to increase 2 percent per year, a typical escalation rate for CFD special taxes. In practice, different special tax rates could be set for different parcels within the CFD, based on land use, distance from the transit stations, which parcels are upzoned, or other reasonable criteria. Alternatively, multiple CFDs could be established, charging different rates on different parcels. However, because the development projections were not parcel-specific, it was assumed for the purpose of this simplified analysis that new development would pay a higher special tax rate than existing development. This assumption was intended to approximate the effect of charging higher special tax rates to properties that would likely be upzoned, since the majority of development opportunity is on those sites.

  The rates shown in Figure B-5 are benchmarked against assessed value, so that the total tax rate (including general property tax and the CFD special tax[22]) amounts to 1.7 percent of the estimated, per-square foot value of new development. This results in per-square-foot rates that are comparable to those proposed for the Transbay Transit Center CFD. Rates for existing development are set at 25 percent of the rates for new development. Although CFD special tax rates cannot be set on *ad valorem* basis in practice, benchmarking the rates to value and overall tax burden is a common and useful way of thinking about the appropriate magnitude for a CFD rate.

[21] City & County of San Francisco, "Draft BOS Policy Guidelines Guiding the Use of Infrastructure Finance Districts in San Francisco," January 10, 2011. Additional analysis would be required to ensure that an IFD in this area would conform to all of the Board's IFD Policy Guidelines.

[22] Includes SF's 1.118% tax rate; does not include additional parcel taxes, payments to the Fisherman's Wharf Community Benefits District, or other taxes, assessments, or fees.

Figure B-5. Base (2017) CFD Special Tax Rates, per Building Square Foot

	New Development	Existing Development
Residential	$4.16	$1.04
Hotel	$3.29	$0.82
Retail	$4.27	$1.07
Office	$3.89	$0.97
Other Non-Residential		$0.82

Rates are assumed to increase by 2 percent a year after 2017.
Source: Strategic Economics, 2014.

- **Special assessment district revenues:** The special assessment district calculation assumes that all properties within a quarter-mile of the stations will pay a special assessment tax, beginning in 2017 at the average per-square-foot rates shown in Figure B-6. After 2017, the rates are assumed to increase by an inflation factor of 2.5 percent per year. Special assessment districts require that the size of assessment be proportional to the special benefits received by property owners. Since the Transportation Sustainability Fee is based on a similar type of relationship (as documented in the nexus study for the fee), the rates shown in Figure B-6 were derived by amortizing the TSF rates over the 20-year time horizon of the fee, and then increasing the assessment by 25 percent in order to account for the greater special benefit of a local improvement compared to a citywide expenditure plan. In practice, most assessment districts set different rates (or tiers) for different parcels, depending on the special benefit each parcel receives; the rates shown in Figure B-6 were chosen to represent a reasonable average rate that could apply across the entire study area.

Figure B-6. Base (2017) Assessment Rates, per Building Square Foot

Residential	$0.35
Hotel	$0.79
Retail	$0.83
Office	$0.79
Other Non-Residential	$0.79

Rates are assumed to increase by an inflation factor (2.5 percent a year) after 2017.
Source: Strategic Economics, 2014.

- **Impact fees:** The impact fee calculation is based on multiplying the square feet of new development that are projected to occur in every year between 2015 and 2047, by the Transportation Sustainability Fee rate. Figure B-7 shows the TSF rates for 2015. Fees are assumed to increase 3 percent per year, based on review of the City's historic Annual Infrastructure Construction Cost Inflation Estimates. The analysis assumes that the fee is implemented in 2015 and renewed after its initial 20-year authorization.

Figure B-7. Transportation Sustainability Fee Rates, per Square Foot of New Development

Residential	$5.53
Hotel	$12.64
Retail	$13.30
Office	$12.64

Rates are assumed to increase by a construction cost inflation factor (3 percent a year) after 2017.
Source: Strategic Economics, 2014.

- **Bonding capacity:** For the IFD, CFD, and special assessment district, bonding capacity was calculated by 1) dividing total revenues projected for each year by a debt service ratio of 120 percent to calculate the annual debt service payments; 2) calculating the net present value of the annual debt payments at the assumed interest rate; and 3) subtracting issuance costs (5

percent). Interest rates for the CFD and special assessment district were set at 4.75 percent and 5 percent a year, respectively, based on recent examples of similar bond issuances across the state. The interest rate for the IFD was set at 8 percent per year, based on underwriting terms provided by Stone and Youngberg to calculate bonding capacity for San Francisco's Rincon Hill IFD.[23] Because IFDs are an untested tool with which investors are unfamiliar, the interest rates for the first several IFDs issued in the state are likely to be significantly higher than current interest rates for CFDs and special assessment districts.

[23] Keyser Marston Associates, Inc., *Infrastructure Financing Plan: Infrastructure Financing District No. 1 (Rincon Hill Area)* (City and County of San Francisco Office of Economic Development, December 2010), http://www.sf-planning.org/ftp/files/Citywide/Draft_Rincon_Hill%20IFD_Infrastructure_Financing_Plan_Dec_2010.pdf.

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Appendix F:

TRANSPORTATION AUTHORITY MEMORANDUM - OUTPUT SUMMARY CENTRAL SUBWAY EXTENSION TO FISHERMAN'S WHARF - 2040

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TRANSPORTATION AUTHORITY MEMORANDUM - OUTPUT SUMMARY CENTRAL SUBWAY EXTENSION TO FISHERMAN'S WHARF - 2040

San Francisco County Transportation Authority
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San Francisco, California 94103
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Memorandum

Date: 09.02.2014

To: Central Subway Project Team

From: Drew Cooper, Transportation Planner

Through: Elizabeth Sall, Deputy Director for Technology, Data & Analysis

Subject: Output Summary Central Subway Extension to Fisherman's Wharf; 2040 CHAMP 4.3 Fury

This memo outlines results from a 2040 SF-CHAMP model run that analyzed an extension of the Central Subway to Fisherman's Wharf. This model run builds on top of previous modeling work from the Central Corridor (now Central SoMa) project, which established a 2040 Baseline scenario, and is intended to help understand how T-Third ridership is affected if the Central Subway were extended from north Chinatown to Fisherman's Wharf. This scenario includes two new stops: the first at Washington Square Park at the former site of the Pagoda Theater in North Beach, and the second at Conrad Square in Fisherman's Wharf. The entire extension is assumed to be below-surface. It is examined here as compared to the 2040 Baseline. A full summary of the assumptions and inputs for the model run can be found in the memo titled: 2040 Central Subway Extension to Fisherman's Wharf Model Input Memo

This memo is organized as follows. First, context is provided to relate the current modeling effort to previous modeling exercises undertaken in 2008 and 2010. Next, CHAMP 4.3 base year results for 2012 are compared with observed Automatic Passenger Counter (APC) data in order to ascertain how well the model performs in this area and whether any post-processing of results is necessary in order to turn raw model results into appropriate forecasts. Next, the ridership for the scenario with the central subway extension to Fisherman's Wharf is compared to the baseline scenario in order to determine the changes in ridership that result from the extension. Next, the memo summarizes the potential for crowding with the extension to Fisherman's Wharf.

CONTEXT OF PREVIOUS MODELING EFFORTS

Two previous travel and ridership forecasts were undertaken for the Central Subway, the first in 2008 and the next in 2010. Both of these forecasts analyzed ridership for the year 2030 for T-Third Phase II, assuming the Central Subway terminates in Chinatown at Stockton and Clay, using the SF-CHAMP 3.1 travel demand model. The 2008 and 2010 ridership forecasts rely on land use projections prepared in 2003. The 2010 forecast included several modifications, including a refined the network to more accurately reflect transfer behavior, and removal of a short "tripper" shuttle. The net result is lower ridership in the 2010 forecast, largely due to a reduction in transfers on and off the T-line at Caltrain and Powell. The forecasts discussed in this memo compare Phase II and Phase III ridership in 2040. These model runs include updated networks, land use, and an updated version of the travel demand model, CHAMP 4.3 Fury. The land use was prepared in 2011 and updated in 2013 per the Jobs-Housing Connection Strategy proposed by Plan Bay Area. This projection has a better balance between jobs and housing and scales back employment forecasts significantly. The 2030 forecast has 100,000 fewer jobs in San Francisco and 1,000,000 fewer jobs Bay Area-wide. By 2040, the revised forecasts

within San Francisco have more households and fewer jobs than Projection 2003 forecasts for 2030, and are distributed differently. The shift from housing to jobs results in a shift from trips driven by the job location to trips driven by the home location, so trips in the AM peak decrease, and trips throughout the rest of the day increase. These changes in land use and travel patterns shift the station-by-station load profile changes such that demand is spread and the load at the max load points is reduced.

Table 1: Land Use Projection Comparison

San Francisco				*Bay Area*			
Model Run Year	**2008, 2010**	**None***	**2014**	**Model Run Year**	**2008,2010**	**None***	**2014**
ABAG Land Use Projection Version	p2003	p2011	p2011	ABAG Land Use Projection Version	p2003	p2011	p2011
Forecast Year	2030	2030	2040	Forecast Year	2030	2030	2040
Households (000's)	*402*	*413*	*447*	Households (000's)	*3,186*	*3,071*	*3,308*
Jobs (000's)	*816*	*715*	*767*	Jobs (000's)	*5,227*	*4,203*	*4,512*
Total (000's)	***1,218***	***1,128***	***1,214***	***Total (000's)***	***8,413***	***7,274***	***7,820***

*the Projection 2011 forecast for 2030 was not used in any model run to evaluate this Central Subway. It is provided here to give context to the land use revisions between 2003 and 2011.

Table 2: T-Third Phase II Ridership Forecast Comparison

Model Run Year	**2008**	**2010**	**2014**
ABAG Land Use Projection Version	p2003	p2003	p2011
Forecast Year	2030	2030	2040
Ridership	***75,933***	***64,620***	***74,168***

VALIDATION OF CHAMP 4.3 IN AREA OF INTEREST

Because the T-Third alignment through the Central Subway is not yet built, there is no observed ridership data available for a direct comparison. As a proxy, we validate modeled vs. observed base year ridership for Muni bus lines that currently serve a similar movement from Fisherman's Wharf / North Beach / Chinatown south through Downtown and SoMa. Routes 30, 45, 8X, 8AX, and 8BX are the lines we considered, excluding the portions of 8X, 8AX, and 8BX serving south of SoMa serving Excelsior and Visitacion Valley. Figure 1 shows the area and Muni lines considered for validation, and Table 3 and

Table 4 show modeled vs. observed boards and exits. The numbers highlighted in yellow are adjusted to account for pass-through trips which begin or end outside of the validation area.

The main concern is validating against the peak period in the peak direction (inbound to downtown in the morning and outbound in the evening). The model estimates about 3% over observed APC data in the AM inbound direction and 7% over in the PM outbound direction. The model produces a good fit to observed data, and furthermore APC data is likely to undercount ridership to some degree so the model's overestimation compensates that undercounting. The base year validation gives us confidence that ridership projections for the T-Third which will serve the same corridor are appropriate.

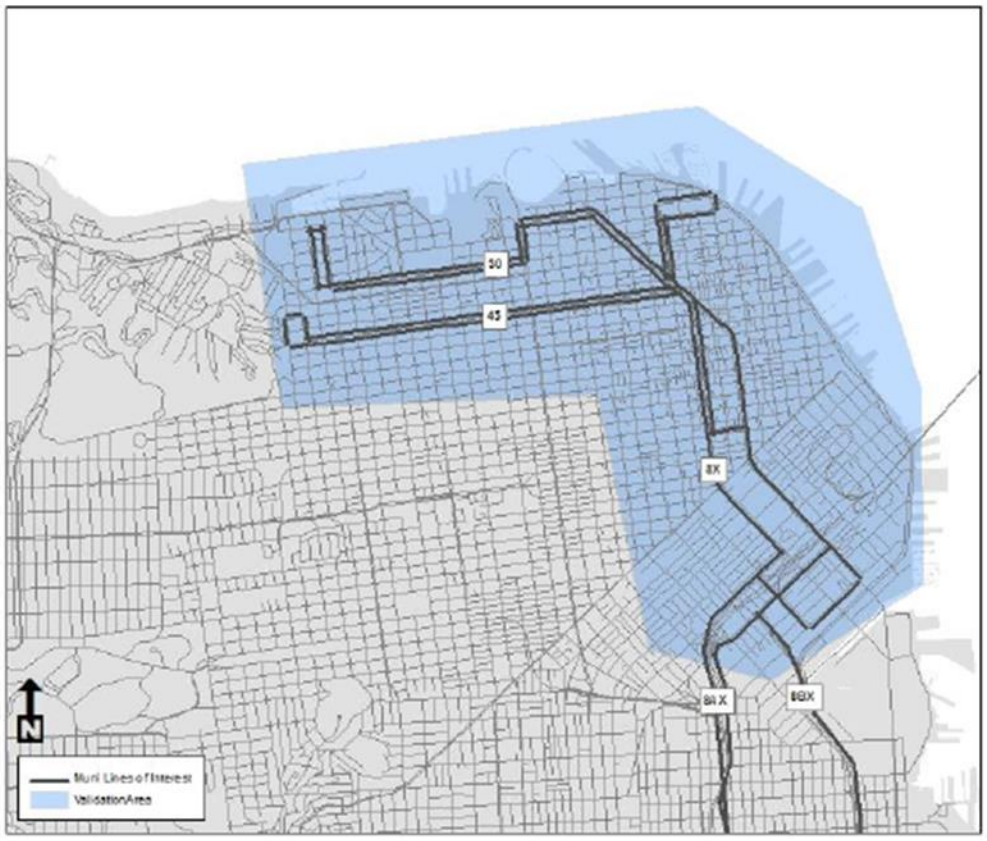

Figure 1: Validation Area with Muni Lines of Interest

Table 3: AM Peak Period Trips on the 30/45/8X/8AX/8BX

	Modeled		*Observed*		*Diff*		*Pct Diff*	
Direction	On	Off	On	Off	On	Off	On	Off
FW -> DT	4,214	4,214	4,079	4,074	135	140	3.2%	3.3%
DT -> FW	4,476	4,476	4,457	4,457	19	19	0.4%	0.4%

* highlighted cells are adjusted to remove trips traveling into our out-of the validation area

Table 4: PM Peak Period Trips on the 30/45/8X/8AX/8BX

	Modeled		*Observed*		*Diff*		*Pct Diff*	
Direction	On	Off	On	Off	On	Off	On	Off
FW -> DT	6,291	6,290	6,166	6,196	125	94	2.0%	1.5%
DT -> FW	5,855	5,856	5,466	5,505	389	351	6.7%	6.0%

* highlighted cells are adjusted to remove trips traveling into our out-of the validation area

T-THIRD RIDERSHIP

The T-Third Phase II reroutes from the current Embarcadero alignment to 4th Street starting at the 4th and King Station, and then enters the Central Subway north of 4th and Brannan. The critical direction in southbound in the AM peak and northbound in the PM peak with over twice as many northbound exits than boards in the morning and over twice as many southbound boards than exits in the evening. Over the course of a day, there are more southbound boards than northbound since the southbound movement gives access to Downtown and SoMa as well as all remaining destinations south.

The same general trends are true when the extension to Fisherman's Wharf is added, although ridership increases significantly. Table 5 summarizes boards and exits in the section north of 4th and King. On the whole, the model shows that daily boards would increase by 25,400 along the section between 4th/King and Fisherman's Wharf. Daily boards along the entire T-Third line would increase by 40,000, over 50% more than the T-Third would carry without the Central Subway extension. Ridership for the entire line is summarized in Table 6.

Table 5: Ridership Overview on T-Third North of Mission Bay Loop

		Daily Boards	*Daily Exits*	AM Boards	AM Exits	PM Boards	PM Exits
Northbound	2040 Baseline	*21,700*	*33,400*	3,200	6,700	10,600	14,300
	2040 Extension	*36,300*	*48,500*	6,300	9,900	15,200	19,000
	Difference	*14,600*	*15,100*	3,100	3,200	4,600	4,700
	% Difference	*67%*	*45%*	97%	48%	43%	33%
Southbound	2040 Baseline	*35,700*	*18,200*	11,600	6,400	10,400	5,400
	2040 Extension	*61,200*	*47,100*	15,500	12,300	17,900	13,400
	Difference	*25,500*	*28,900*	3,900	5,900	7,500	8,000
	% Difference	*71%*	*159%*	34%	92%	72%	148%

Table 6: Ridership Overview on T-Third

		Daily Boards	AM Boards	PM Boards
Northbound	2040 Baseline	*36,000*	7,600	14,900
	2040 Extension	*51,000*	10,900	19,600
	Difference	*15,000*	3,300	4,700
	Pct Difference	*42%*	43%	32%
Southbound	2040 Baseline	*38,300*	12,000	11,500
	2040 Extension	*63,700*	15,900	18,900
	Difference	*25,400*	3,900	7,400
	Pct Difference	*66%*	33%	64%
Total	2040 Baseline	*74,300*	19,700	26,400
	2040 Extension	*114,700*	26,800	38,500
	Difference	*40,400*	7,100	12,100
	Pct Difference	*54%*	36%	46%

The Muni system sees a net gain of 9,500 daily trips. This indicates that many of the T-Third's new

riders are drawn from other Muni transit lines, but around 9,500 are new transit riders from other modes. Other Muni lines benefit from reduced crowding, particularly those serving the same corridor as the T-Third. Muni crowding will be discussed in greater detail in the following section.

Table 7: Muni System-wide Ridership

	Daily Boards	AM Boards	PM Boards
2040 Baseline	*1,020,314*	223,262	285,799
2040 Extension	*1,029,823*	225,682	289,378
Difference	*9,509*	2,420	3,579
% Difference	*0.9%*	1.1%	1.3%

In both the Baseline and Extension to Fisherman's Wharf scenarios, southbound from Stockton/Geary to 4th/Folsom is the critical load in the morning peak and northbound from 4th/Folsom to Stockton/Geary in the evening peak. In the 2040 Baseline this station-to-station segment reaches 66% capacity and in the 2040 Extension it reaches about 73% capacity of the combined T-Third and T-Third Short Lines. Station-by-station boards, exits, and volumes for each scenario are summarized in Table 8 and Table 9.

Table 8: AM Peak Period Volume by Station

	Station	2040 Baseline Boards	2040 Baseline Exits	2040 Baseline Volume	2040 Extension Boards	2040 Extension Exits	2040 Extension Volume	Difference Boards	Difference Exits	Difference Volume
AM Northbound	***South of Mission Bay Loop***	4,453	980		4,581	978		128	-2	
	|			3,473			3,603			130
	3rd and Mariposa	305	168		319	166		15	-2	
	|			3,610			3,757			146
	3rd and Gene Friend	119	558		123	553		4	-5	
	|			3,171			3,326			155
	3rd and Mission Rock	199	188		203	185		5	-3	
	|			3,182			3,345			163
	4th and King	479	169		605	176		127	6	
	|			3,491			3,774			283
	4th and Brannan	838	270		908	269		70	-2	
	|			4,059			4,413			354
	4th and Folsom	318	445		391	440		73	-5	
	|			3,933			4,365			432
	Stockton and Geary	932	3,009		3,402	2,960		2,470	-49	
	|			1,856			4,807			2,951
	Stockton and Clay	0	1,856		273	1,314		273	-542	
	|			0			3,766			3,766
	Washington Square	0	0		74	1,602		74	1,602	
	|			0			2,238			2,238
	Conrad Square	0	0		0	2,238		0	2,238	0
AM Southbound	*Conrad Square*	0	0		2,651	0		2,651	0	
	|			0			2,651			2,651
	Washington Square	0	0		2,173	65		2,173	65	
	|			0			4,759			4,759
	Stockton and Clay	2,350	0		1,618	451		-732	451	
	|			2,350			5,926			3,576
	Stockton and Geary	8,394	1,067		8,246	3,728		-148	2,660	
	|			9,676			10,444			768
	4th and Folsom	414	764		349	966		-65	202	
	|			9,327			9,828			501
	4th and Brannan	171	2,210		170	2,366		-1	155	
	|			7,287			7,632			345
	4th and King	161	414		162	489		0	75	
	|			7,034			7,304			270
	3rd and Mission Rock	40	444		50	961		11	517	
	|			6,630			6,394			-236
	3rd and Gene Friend	53	1,224		51	2,659		-2	1,436	
	|			5,459			3,785			-1,673
	3rd and Mariposa	36	294		42	609		6	315	
	|			5,201			3,218			-1,982
	South of Mission Bay Loop	429	5,630		408	3,627		-21	-2,003	

Table 9: PM Peak Period Volume by Station

	Station	2040 Baseline Boards	2040 Baseline Exits	2040 Baseline Volume	2040 Extension Boards	2040 Extension Exits	2040 Extension Volume	Difference Boards	Difference Exits	Difference Volume
PM Northbound	***South of Mission Bay Loop***	4,327	580		4,455	581		128	1	
				3,747			3,874			127
	3rd and Mariposa	848	87		905	90		56	3	
				4,508			4,689			181
	3rd and Gene Friend	2,226	320		2,364	286		139	-34	
				6,414			6,767			353
	3rd and Mission Rock	800	122		851	120		51	-2	
				7,092			7,498			406
	4th and King	838	352		953	328		116	-24	
				7,578			8,123			545
	4th and Brannan	3,907	241		4,182	240		275	0	
				11,244			12,065			821
	4th and Folsom	680	614		980	594		300	-20	
				11,310			12,451			1,141
	Stockton and Geary	1,291	9,778		4,242	9,703		2,952	-75	
				2,822			6,990			4,168
	Stockton and Clay	0	2,822		563	1,845		563	-978	
				0			5,708			5,708
	Washington Square	0	0		125	2,845		125	2,845	
				0			2,988			2,988
	Conrad Square	0	0		0	2,988		0	2,988	
PM Southbound	*Conrad Square*	0	0		6,213	0		6,213	0	
				0			6,213			6,213
	Washington Square	0	0		2,755	151		2,755	151	
				0			8,817			8,817
	Stockton and Clay	3,804	0		2,447	623		-1,357	623	
				3,804			10,641			6,838
	Stockton and Geary	4,418	2,175		4,337	8,337		-81	6,162	
				6,046			6,641			595
	4th and Folsom	609	768		604	856		-5	88	
				5,887			6,389			501
	4th and Brannan	443	1,151		441	1,217		-3	66	
				5,180			5,613			433
	4th and King	307	687		223	818		-84	131	
				4,800			5,018			218
	3rd and Mission Rock	156	218		167	490		11	271	
				4,738			4,696			-42
	3rd and Gene Friend	510	207		503	443		-8	236	
				5,041			4,755			-285
	3rd and Mariposa	192	201		197	427		5	226	
				5,031			4,525			-506
	South of Mission Bay Loop	1,042	6,073		978	5,503		-64	-570	

CROWDING

Projected volumes on the T-Third do not exceed capacity or reach a "crowded" level of 85% capacity in the 2040 Extension Scenario. The maximum load in the Central Subway on any link and any time period is 74% in the PM peak between 4th/Folsom and Stockton/Geary in the inbound direction. Assuming an AM peak hourly peaking factor of 0.348 and a PM peak hourly peaking factor of 0.337, vehicle capacity of 238 passengers, and 2.5-minute peak period headways, Table 10: Central Subway Max Load shows the peak hour load for Baseline and Extension scenarios. In each case the peak load occurs between 4th/Folsom and Stockton/Geary in the northbound direction. *Attachment 1: T-Third Maximum Load – Phase II vs. Phase III* provides a comparison of maximum loads with the Central Subway Extension show peak load locations for the AM and PM peaks.

Table 10: Central Subway Max Load

		Period Volume	Peak Volume	Period Capacity	Peak Capacity	Peak Load
AM Peak Max Load	2040 Baseline	9,676	3,261	17,136	5,706	0.57
	2040 Extension	10,444	3,520	17,136	5,706	0.62
PM Peak Max Load	2040 Baseline	11,310	3,811	17,136	5,706	0.67
	2040 Extension	12,451	4,196	17,136	5,706	0.74

Crowding decreases significantly on the E and F lines, and tourist trips are drawn off the Powell-Mason Cable Car. The bus lines 30/45/8X/8AX/8BX, which also serve Fisherman's Wharf and North Beach to Downtown and SoMa, also see a reduction in ridership as trips shift to the T-Third. On those lines, in the validation corridor used in the first section, daily trips decrease by 1,700. Table 11: Muni Trips on 30/45/8X/8AX/8BX in the Validation Corridor the highlighted cells are adjusted to remove trips from the 8X/8AX/8BX buses passing into and out-of the validation corridor. Table 12: Muni Trips on E/F/Powell-Mason within the Validation Corridor shows the same breakdown for the E/F/Powell-Mason lines. Figure 2 and Figure 3 below show crowding on the Muni lines mentioned above with the Central Subway to Chinatown and extended to Fisherman's Wharf, respectively.

Table 11: Muni Trips on 30/45/8X/8AX/8BX in the Validation Corridor

		2040Baseline		2040Extension		Diff		Pct Diff	
	Direction	On	Off	On	Off	On	Off	On	Off
AM Peak	FW -> DT	5,278	5,277	5,020	5,020	-257	-257	-4.9%	-4.9%
	DT -> FW	4,788	4,789	4,363	4,364	-425	-425	-8.9%	-8.9%
PM Peak	FW -> DT	4,243	4,243	3,918	3,918	-325	-325	-7.7%	-7.7%
	DT -> FW	4,919	4,919	4,869	4,869	-50	-50	-1.0%	-1.0%
Daily	FW -> DT	21,019	21,018	20,055	20,055	-964	-964	-4.6%	-4.6%
	DT -> FW	22,521	22,522	21,772	21,773	-749	-749	-3.3%	-3.3%

Table 12: Muni Trips on E/F/Powell-Mason within the Validation Corridor

		2040Baseline		2040Extension		Diff		Pct Diff	
	Direction	On	Off	On	Off	On	Off	On	Off
AM Peak	FW -> DT	2,959	2,959	1,159	1,158	-1,801	-1,801	-60.8%	-60.8%
	DT -> FW	2,634	2,634	1,235	1,235	-1,399	-1,399	-53.1%	-53.1%
PM Peak	FW -> DT	6,856	6,856	3,158	3,158	-3,698	-3,699	-53.9%	-53.9%
	DT -> FW	4,901	4,901	2,757	2,757	-2,144	-2,144	-43.8%	-43.7%
Daily	FW -> DT	26,762	26,762	11,001	11,001	-15,761	-15,761	-58.9%	-58.9%
	DT -> FW	18,665	18,666	10,699	10,699	-7,967	-7,966	-42.7%	-42.7%

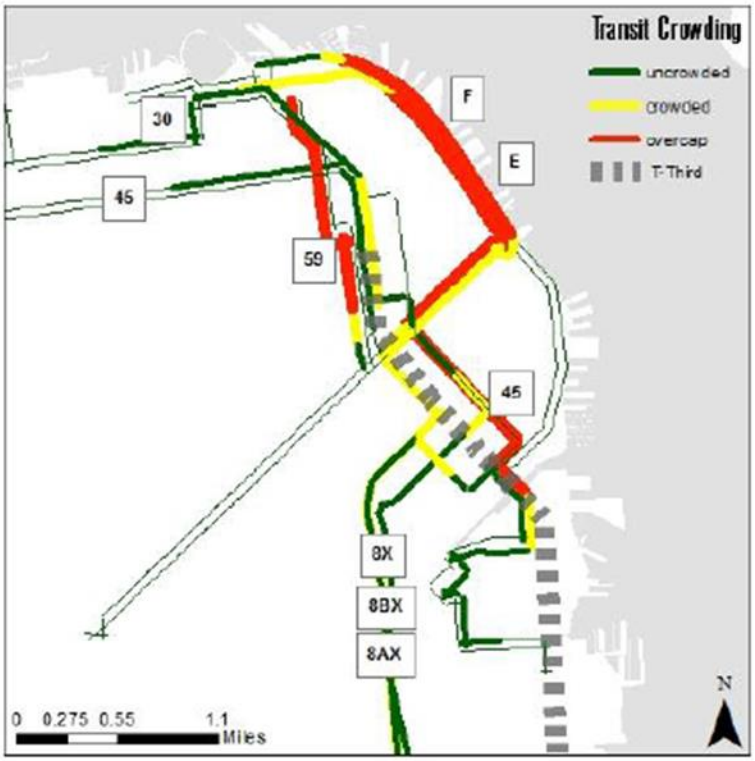

Figure 2: Crowding on Select Muni Lines with Central Subway to Chinatown

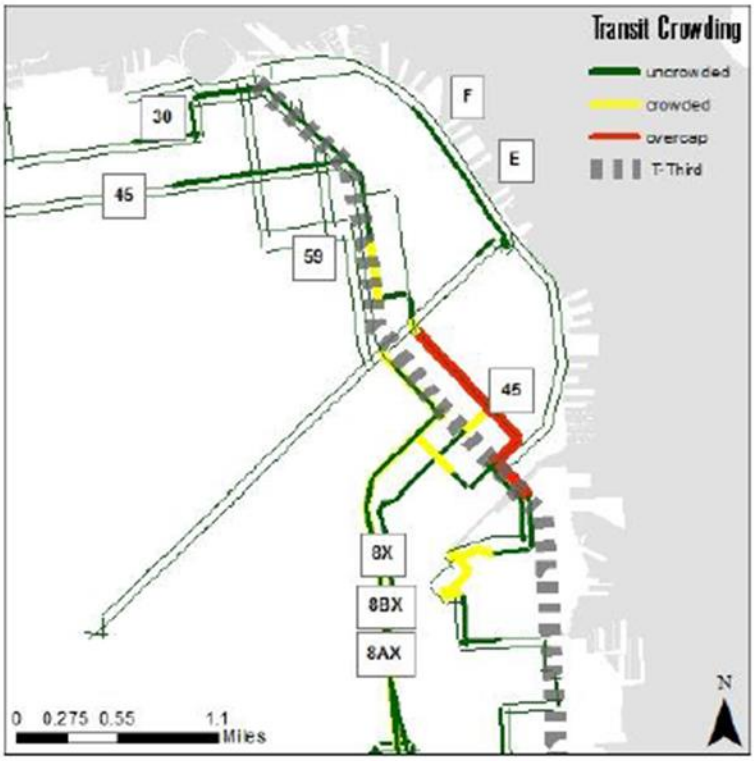

Figure 3: Crowding on Select Muni Lines with Central Subway to Fisherman's Wharf

Riders transferring between the T-Third and BART or Muni Metro will leave the Central Subway at the Union Square Station at Stockton/Geary and enter BART or Muni through the Powell Street Station (or vice-versa). This transfer point is expected to increase boards and exits at Powell. Below, Table 13 shows the expected increase in boardings with the extension to Fisherman's Wharf.

Table 13: Powell Street Station Boardings

		Daily Boards	Daily Exits	AM Boards	AM Exits	PM Boards	PM Exits
Muni Metro	2040 Baseline	*23,900*	*22,900*	*3,000*	*6,600*	*8,500*	*5,000*
	2040 Extension	*25,700*	*24,000*	*3,300*	*7,100*	*9,300*	*5,300*
	Difference	*1,800*	*1,100*	*300*	*400*	*700*	*300*
	% Difference	*8%*	*5%*	*10%*	*7%*	*9%*	*5%*
BART	2040 Baseline	*42,100*	*45,100*	*4,300*	*17,600*	*17,700*	*8,600*
	2040 Extension	*43,200*	*46,600*	*4,400*	*18,300*	*18,300*	*9,000*
	Difference	*1,100*	*1,500*	*100*	*700*	*600*	*400*
	% Difference	*3%*	*3%*	*2%*	*4%*	*4%*	*4%*

Appendix G

THIRD STREET LIGHT RAIL PHASES 1 + 2 – 2018-2030 SERVICE INTEGRATION PLAN – REVISION 1

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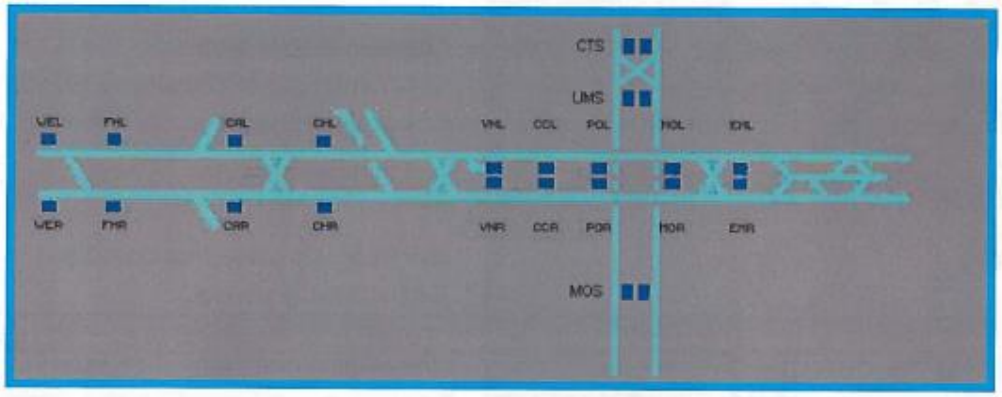
THIRD STREET LIGHT RAIL PHASES 1 + 2 – 2018-2030 SERVICE INTEGRATION PLAN – REVISION 1

San Francisco Municipal Transportation Agency
San Francisco, California 94103



Third Street Light Rail Phases 1+2

2018-2030 Service Integration Plan

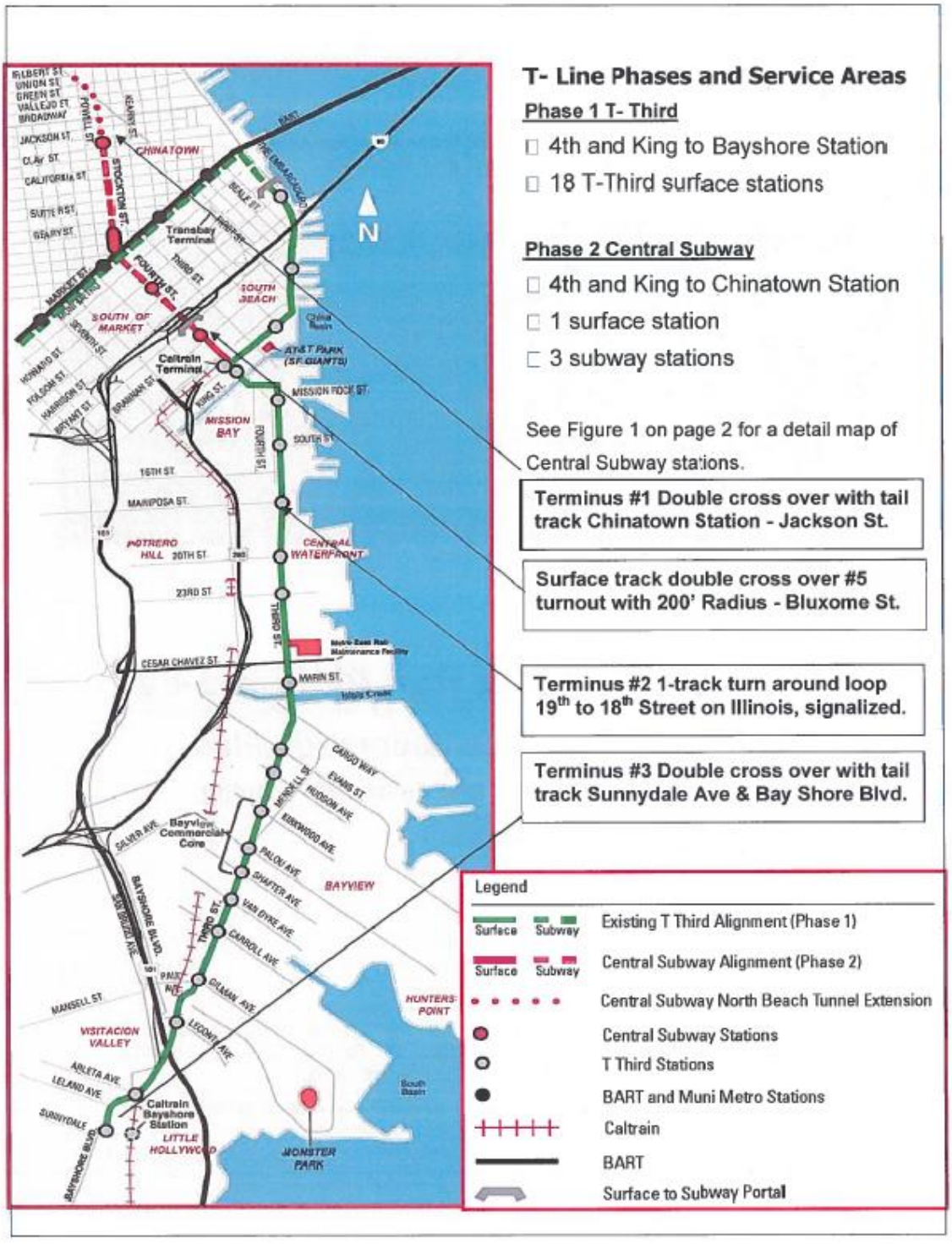
For Operations, Fleet, and Financial Planning

Revision 1

March 2011

This SFMTA document responds to Federal Transit Administration Full Funding Grant Agreement Roadmap Action 18, Task 5, "SFMTA Executive Sign off of the T-Third Phase 1 + 2 Service Integration Plan."

Updated paragraphs in revision 1 are noted with right hand vertical margin lines.


T- Line Phases and Service Areas
Phase 1 T- Third
4th and King to Bayshore Station
18 T-Third surface stations
Phase 2 Central Subway
4th and King to Chinatown Station
1 surface station
3 subway stations
See Figure 1 on page 2 for a detail map of Central Subway stations.
Terminus #1 Double cross over with tail track Chinatown Station - Jackson St.
Surface track double cross over #5 turnout with 200' Radius - Bluxome St.
Terminus #2 1-track turn around loop 19th to 18th Street on Illinois, signalized.
Terminus #3 Double cross over with tail track Sunnydale Ave & Bay Shore Blvd.
Legend
Existing T Third Alignment (Phase 1)
Central Subway Alignment (Phase 2)
Central Subway North Beach Tunnel Extension
Central Subway Stations
T Third Stations
BART and Muni Metro Stations
Caltrain
BART
Surface to Subway Portal
CHINATOWN
Transbay Terminal
SOUTH BEACH
SOUTH OF MARKET
Caltrain Terminal
AT&T PARK (SF GIANTS)
MISSION BAY
MISSION ROCK ST
16TH ST
MARIPOSA ST
POTRERO HILL
20TH ST
23RD ST
CENTRAL WATERFRONT
CESAR CHAVEZ ST
MARIN ST
Bayview Commercial Core
BAYVIEW
HUNTERS POINT
VISITACION VALLEY
Caltrain Bayshore Station
LITTLE HOLLYWOOD
MONSTER PARK
SUNNYDALE

SFMTA Third Street Light Rail Phase 2 – *Central Subway*
Service Integration Plan for Operations, Fleet, and Financial Planning

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E Muni Metro Track System Map with Phase 2 Inserted

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Third Street Light Rail Phases 1 + 2 Service Integration Plan

1.0 T- Line Phase 2 Summary

This document presents a set of service plans to integrate the Third Street Light Rail Phase 1, the Third Street T-Line, with Phase 2, the Central Subway.

The Phase 1 T-Line is a 5.1 mile surface route serving Caltrain, the AT&T baseball park, the Mission Bay area and new UCSF campus, the Central Waterfront, and the residential areas of Bayview-Hunters Point, Visitacion Valley, and Little Hollywood.

Phase 2 extends the T-Line onto the Central Subway, a 1.7 mile surface-and-subway route as shown in Figure 2. The extension includes four new stations:

- Chinatown (CTS): subway station and terminus
- Union Square-Market Street (UMS): subway station with connection to the Powell Street Muni-BART station
- Moscone (MOS): subway station serving the convention center and Yerba Buena museum district
- Fourth and Brannan (4th/Brannan): surface station serving SOMA

The completed T-Third line will operate as a stand-alone line, separate from the guideway, signal system, and schedules of the existing Muni Metro service under Market Street.

1.1 Use of Service Integration Plan

The Service Integration Plan is intended for use by SFMTA stakeholders to integrate the Central Subway into the operations, fleet, ridership, scheduling and financial planning of the overall Agency. This plan was developed with and reviewed by SFMTA stakeholders in 2010 for use in Final Design. The plan was updated to Revision 1 in March 2011.

The service plan builds upon the T-Third light rail transit program Phase 1 Initial Operating Segment (IOS). The executive summary of the 2006 *T-Third Phase 1 Star-Up & Operating Plan* is included as Appendix D for reference and continuity.

The Agency may further refine and adjust the plans presented here as the start of revenue service approaches and thereafter as warranted.

The use of the Service Integration Plan by Agency stakeholders prior to the start of revenue service is summarized below.

Figure 2: Detail of Central Subway Phase 2 Line

The map on back of cover page shows the Phase 1 and Phase 2 Project map and legend.

Use in the Travel Forecast

The service plans are used by the San Francisco County Transportation Authority (SFCTA) travel forecast model assumptions that influence travel demand and the corridor population's choice of modes, including:

- Headways by time of day and day of week
- Hours of service and travel times
- Route miles and station locations

The 2018 and 2030 travel demand projections from the SFCTA were developed concurrently with the service plans, to match the line capacity with ridership projections.

Use by SFMTA Operations

The service plans were developed with and reviewed by senior staff from the SFMTA Operations and Service Planning departments. The comments received were documented and appropriate responses were prepared as part of the Final Design Quality Assurance procedures. The first draft of the Service Integration Plan was circulated in the 4th Quarter of 2009. Revision 0 of the Plan was approved with comment in the 3rd Quarter of 2010.

Use in the Financial Plan

The Service Plans are the source for the 2010 operation and maintenance cost models for the Project and SFMTA.

The costs are based on unit cost developed for the SFMTA O&M cost model and calibrated with actual SFMTA expenses and service delivered in FY 2008, ending June 30, 2008. Line-item costs are determined according to the volume of service supplied and other system characteristics such as track miles, consistent with the approach suggested by the FTA in *Procedures and Technical Methods for Transit Project Planning.*

1.2 Previous Service Plans

Prior to 2009, service plans for the Central Subway used three loops to provide service: the "Long Line" from Chinatown to Sunnydale, the "Short Line" from Chinatown to Mission Bay, and the "Very Short Line" from Chinatown to Caltrain.

The "Very Short Line" route was reassessed during the 2008-09 FTA Risk Assessment, because of the regular switchbacks on the main line for the three hour peak periods. Instead, opening year 2018 capacity was delivered with the two longer routes only, at 6 minute headways each. To meet design year 2030 requirements, 5 minute headways were needed on the two longer routes, but a supplementary "tripper" service from Chinatown to Caltrain was also required. This tripper service was scheduled to meet the demand during the peak hour at the Caltrain station, but used fewer total service hours and miles than the previous service plan.

1.3 2010 Service Plan Analysis and Revisions

In 2010, the Central Subway Project and SFMTA Service Planning collaborated to further revise the service plans. Concurrently, a July 2010 updated ridership forecast was produced by the San Francisco County Transportation Authority (SFCTA). Staff from SFMTA Service Planning Department, Central Subway Project, and SFCTA modelers worked jointly to update the travel forecast model and provide consistency between forecasts and the service plans. Specific updates are summarized in the following sections.

Inclusion of TEP and Van Ness BRT in Forecast

The travel model included improved transit service throughout San Francisco by including two major SFMTA initiatives that are expected to be completed prior to Central Subway opening: the Transit Effectiveness Project (TEP), and the Van Ness Bus Rapid Transit Project (VNBRT). Both projects improve connections and travel time throughout the system, including routes that connect to the T-Third, or for some trips, provide alternatives to the T-Third.

Model Improvements - Passenger Behavior at Transit Transfers

The forecast also made changes to the network to more accurately model passenger behavior at two important transfer connections: Union Square-Market Street Station (UMS) to Powell Muni-BART Station (Powell), and 4th Street/King Street Station at Caltrain. Changes to the network included addition of a walk transfer time between UMS and Powell; and universal application of standard perceived board penalties for transit trips with more than 3 transfers, which previously had not been applied to some Caltrain users.

Updated Model Results

An initial model run included the 2009 service plan for the T-Third and showed reduced T-Third ridership and reduced peak passenger loads. Both the transfer changes and the improvements in service on other lines contributed to this decline. Most of the loss of daily riders comes from fewer travelers using the Central Subway as a transfer connection between the two major transfer points, although this segment remains the most heavily used of the alignment. T-Third and Central Subway ridership forecasts remain higher most peer transit lines, including all other Muni Metro routes.

Despite the lower number of T-Third trips, total system travel time savings due to the Central Subway Project increased by 13 percent compared to the previous forecast, confirming that the link works in concert with other SFMTA projects to provide a robust transit network.

Service Plan Revisions to Balance Peak Loads and Service Levels

Using the initial run results, the service plan was revised based on the reduced peak loads. The revisions were developed with the SFMTA Service Planning department to incorporate the TEP's principles for reliability of service, such as universal design for the peak hour of demand, and preserving capacity to accommodate variations in crowding. Generally, headways in both years were increased, slightly reducing frequency of service.

- √ In 2018, service was changed from a mix of 1 and 2-car train sets at 3 minute combined headways along the short line, to all 2-car trains at 3.75 minute headways.
- √ In 2030, the special "Tripper" service that served Caltrain-to-Chinatown during the peak hour was eliminated, while the base service of 2-car trains at 2.5 minute combined headways remains.

The ridership model was run again, including the revised T-Third service plans. Final checks were performed to ensure the T-Third line and other service in the Central Subway corridor has not been overloaded.

2.0 Baseline Service

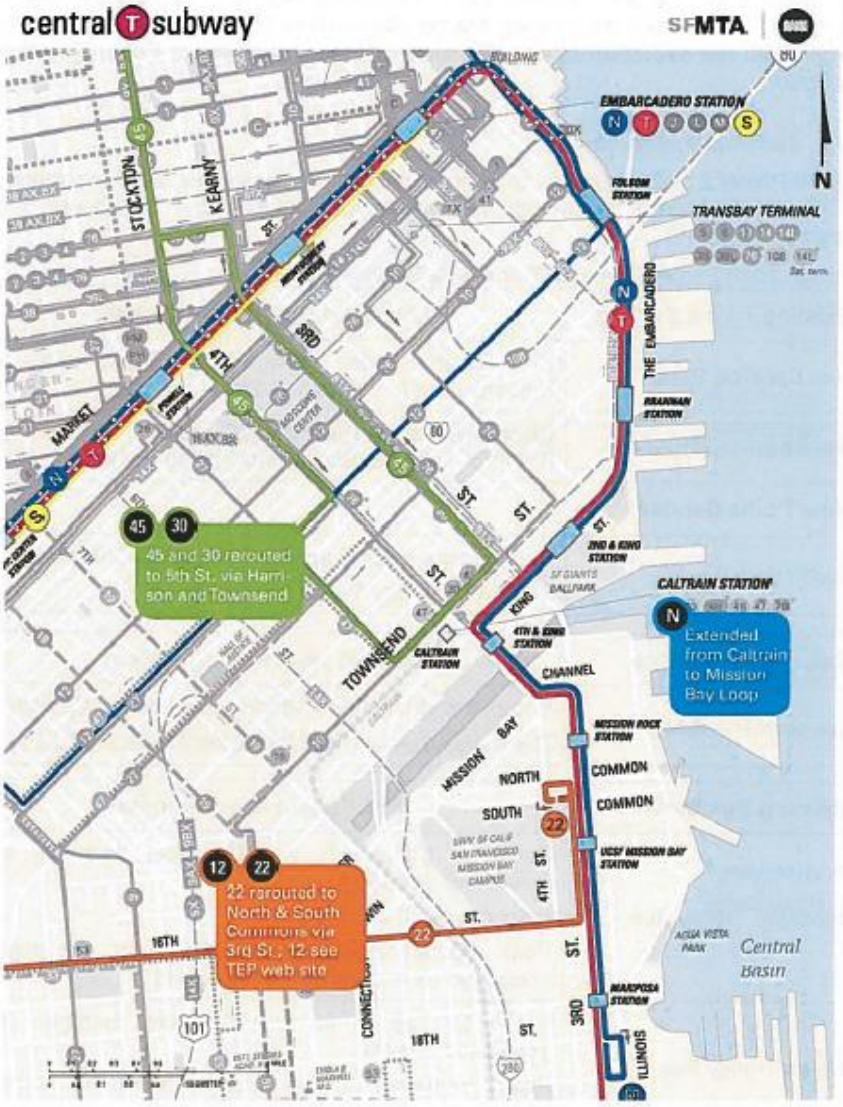
The Baseline Service is used to capture the Central Subway impact on operations. The Transit Effectiveness Project (TEP) is expected to be completed by 2018, and therefore is considered part of the baseline level of service.

Project area bus service and light rail service that is anticipated prior to the Central Subway opening, generally based on TEP or Service Planning guidance, is summarized in Figure 3 and illustrated in Figure 4.

Figure 3: 2018 Project Area Baseline Service

A. Baseline Light Rail Service	Notes and Changes from Present Day Service
T/K-Line Baseline Route	T/K Line continues to operate between Sunnydale T–Line Terminus and Balboa Park K–Line Terminus.
N-Line Baseline Route	N–Line extended from Caltrain to Mission Bay Loop as needed to meet demand from increased development.
E-Line Historic Streetcar	E–Line historic streetcar service added to the Embarcadero between Fisherman's Wharf and Caltrain as part of TEP.
B. Baseline Bus Service	
22-Fillmore Trolley Bus Route	22 Line rerouted from 16th street to North and South commons as part of TEP.

Figure 4: Project Corridor Baseline Transit Service



3.0 Operations Plan

After opening the Central Subway, the T-Third Line will be a stand-alone line and operate separately from the existing Market Street Muni Metro light rail and streetcar network, with the exception of one diamond rail-to-rail crossing at Fourth Street and King Street.

3.1 Start-Up Operations

FY 2018 Phase 2 start of Central Subway new light rail service will result in changes in the Project area existing light rail and bus service summarized in Figure 5 and illustrated in Figure 6.

Figure 5: 2018 Project Area LRT and Bus Service Changes

A. Existing T Line Service	T Line Start Up Service Changes
T- Line Baseline Route	Discontinue service along King Street and the Embarcadero to the Market Street subway.
K-Line Baseline Route	Discontinue the K/T-line through route. Return K-line to Embarcadero Station terminal.
B. New T Line Service	
T-Line Project Route	Start direct service from Fourth Street to Chinatown. Start Mission Bay T-Line short route.

C. Existing LR Service	2018 Project Area Changes
N-Line Baseline Route	Return the N-Line from Mission Bay Loop to Caltrain. This is a change from the Baseline terminus at Mission Bay.

D. Existing Bus Service	2018 Project Area Changes
30-Stockton Trolley Bus	Route to Caltrain is via 5th Street, Harrison and Townsend Streets. Discontinue 30 short route. Peak frequencies may increase from 10 minute headways as needed to meet demand.
45-Union Trolley Bus	Route to Caltrain is via 5th Street, Harrison and Townsend Streets. Peak frequency may increase from 10 minute headways as needed to meet demand.

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Figure 6: Central Subway Area Light Rail Service

3.2 Route Analysis and Stations

The T-Line will continue to follow the surface Phase 1 alignment for all operations south of the 4th and King intersection. The Central Subway portion begins with northbound trains on 4th Street proceeding straight across King Street to a double portal between Harrison Street and Bryant Street, where they enter the subway portion of the alignment. There will be a semi-exclusive right-of-way for the four blocks of surface operation and a surface station between Brannan and Bryant Street similar to the surface station platforms on Third Street.

In the subway, trains will operate under the Advanced Train Control System (ATCS) at speeds up to 50 mph. Under ATCS control, trains automatically stop at each station and open their doors. Trains will serve passengers at three subway stations: Moscone Center, Union Square/Market, and Chinatown. Passengers who want to connect with the existing Market Street Subway will use a pedestrian walkway connecting to the existing Muni/BART Powell Station.

Figures 7 through 12 illustrate the Chinatown, Union Square, and Moscone subway stations. **Note that these graphics are representative, but may not show all current design details**. Final graphics will be produced at 100% Final Design.

Trains will terminate at Chinatown Station. See subheading 3.2.7 for details of the turnback.

3.2.1 Short Line Route: Chinatown to Mission Bay

The Short Line from Chinatown to Mission Bay will use the switch at 18th Street to the clockwise loop track on Illinois as the short line terminal instead of going to Sunnydale. Trains return via 19th Street to 3rd and continue to the CS. The loop is anticipated to be completed prior to Central Subway's 2018 opening. This loop is an efficient route to serve the bulk of the ridership that is concentrated in the Central Subway stations and the Mission Bay development. This Short Line supplements the CS long line service. The route serves the following stations:

Subway Stations

1. Chinatown
2. Market Union Square
3. Moscone

Surface Stations

4. 4th and Brannan (New)
5. 4th and King (Existing IOS)
6. Mission Rock
7. UCSF Mission Bay

8. Mariposa

3.2.2 Turnback Operations at Mission Bay Loop

South of Mariposa Station, trains running the Short Line will enter the clockwise Mission Bay Loop along 18th Street, follow the loop along Illinois Avenue, and return along 19th Street to Third Street northbound.

Seven minutes are included in the cycle time for this operation and any layover time.

Currently, the loop is incomplete, as the track along Illinois has yet to be installed. The completion of the loop is a stand-alone project in the SFMTA Capital Investment Plan. As of spring 2011, the project has reached 40% detailed design, but is not yet fully funded. The SFMTA is committed to identifying the remaining funding and completing the project in advance of the Central Subway opening.

3.2.3 Fourth Street and King Street Intersection

At the Fourth Street and King Street Intersection, the T-Line will continue along Fourth Street through the intersection to rejoin the surface IOS alignment.

This intersection is the endpoint of overlap between T-Line service and trains pulling in and out of the Muni Metro East facility to serve other lines. Central Subway's configuration improves capacity by eliminating the left turns during normal service. The intersection will perform better with the project, but will remain an operations challenge, especially during pull-in and pull-out.

In collaboration with Service Planning, the intersection was reviewed by CS Project and Transit Engineering staff to determine potential for improvements. A reasonable upper limit would allow one train in each direction per cycle. Current interaction between the signal, the track switch, and the adjacent crossover on King Street lowers this result.

With the new diamonds and interlocking installation and commissioning, the light rail throughput capacity of the intersection will be optimized by reprogramming the signal and switch controller. Coordination of train schedule with signal cycle time could further improve throughput. Transit simulation by SFMTA Service Planning may be used to identify efficient intersection options.

This process will be developed before construction and will include participation of Transit Operations acceptance of the work at the completion and sign off of the construction and signal systems.

3.2.4 Moscone Station (MOS)

Platform Configuration: Center platform, end loaded from south

Platform Length: 200 feet Platform Area: 5200 square feet

Platform Average Depth: 58 feet below 4th Street at Folsom

Number of Elevators from Concourse: 2 to platform, 2 to surface

Number of Escalators from Concourse: 2 to platform, 2 to surface

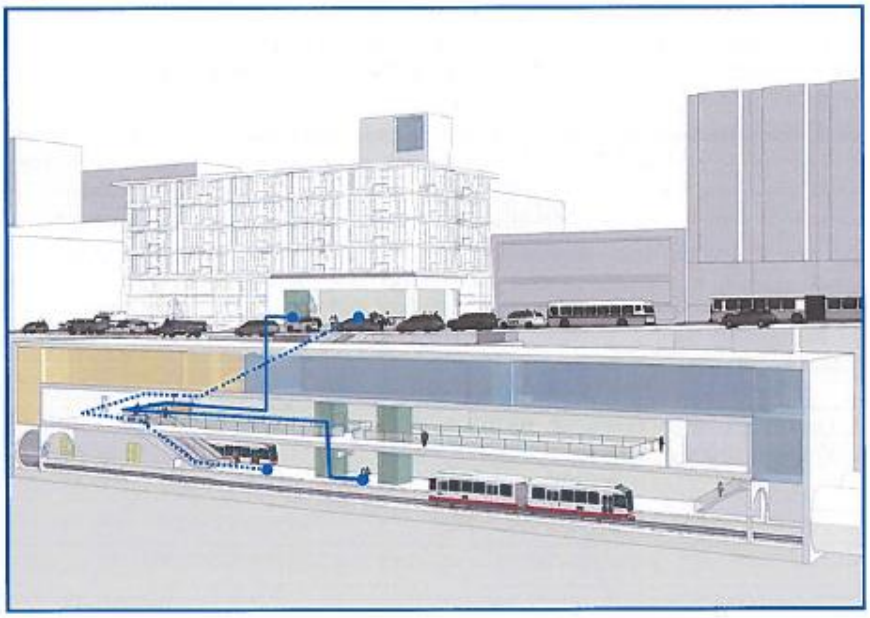
Projected 2018 Passenger Volume: 2,300 daily boardings and 2,600 daily exits

Projected 2018 Departing Loads: 17,700 northbound and 13,900 southbound passengers daily

The figure below shows the Moscone Station circulation diagram from a potential new development on the surface, to the station platform via the mezzanine level.

The dotted lines show travel using the escalators for vertical movement. The solid blue lines show travel between the surface and platform using walkways and elevators.

Figure 7: Moscone Station (Yerba Buena Station)



3.2.5 Union Square / Market Street Station (UMS)

Platform Configuration: Center platform, end loaded from north and south

Platform Length: 210 feet Platform Area: 5775 square feet

Platform Average Depth: 93 feet below Stockton Street

Number of Elevators from Concourse: 2 to platform, 4 to surface

Number of Escalators from Concourse: 5 to platform, 2 to surface

Projected 2018 Passenger Volume: 15,500 daily boardings and 17,300 daily exits

Projected 2018 Departing Loads: 5,900 northbound and 15,200 southbound passengers daily

In Figure 8 below, the "A" in the station profile below marks the location of the point of view from the perspective image. The perspective from location "A" is from the UMS platform, looking toward the glass elevator shaft and escalator that lead to transfer connections to Powell Station's BART and Muni Metro service.

Figure 8: Union Square / Market St. Station Profile and Perspective Views

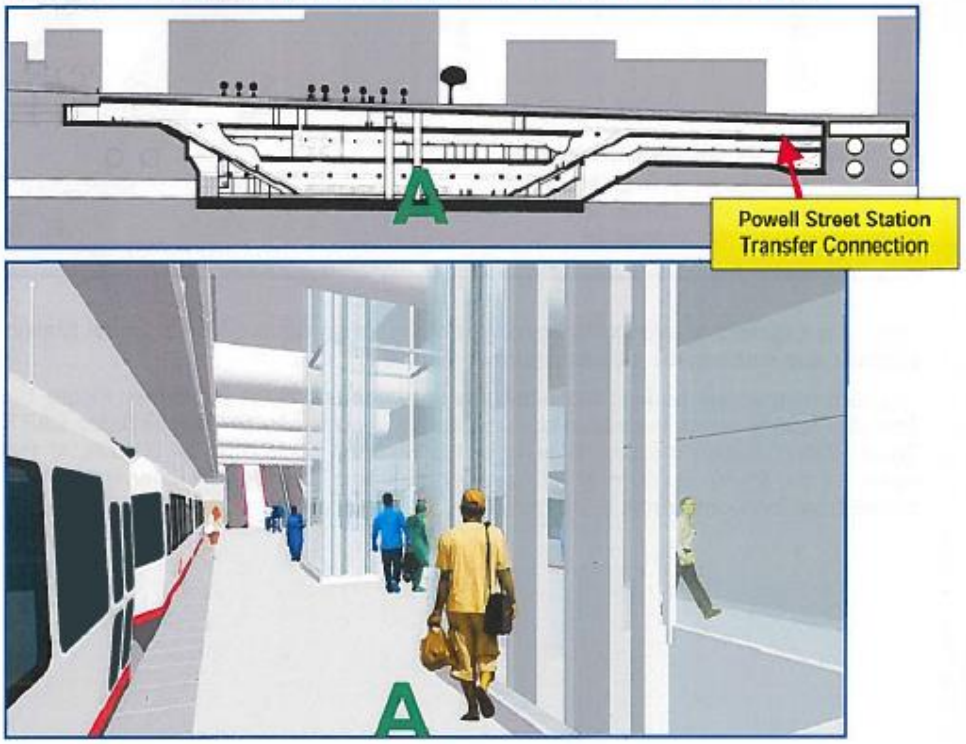


Figure 9: Union Square Market Street / Powell Street Station Paths to Transfers

The "A" in **Figure 9** above marks the center of the Union Square Market Street Station platform, and matches the location shown in **Figure 8**.

The path from A to B leads to the escalators shown at end of the platform in Figure 10. The path from B to C is the escalator that leads to new hallway connecting to the BART Powell Street Station mezzanine and the top of BART escalators at D down to the center of the BART platform at F. Average walk time to make the connection from between platform centerlines is 4.8 minutes.

3.2.6 Chinatown Station (CTS)

Platform Configuration: Center platform, center loaded

Platform Length: 200 feet Platform Area: 5200 square feet

Platform Average Depth: 77 feet below Stockton Street

Number of Elevators from Concourse: 2 to platform, 2 to surface

Number of Escalators from Concourse: 2 to platform, 2 to surface

Projected 2018 Passenger Volume: 5,300 daily boardings and 5,900 daily exits

Projected 2018 Departing Loads: 5,300 daily southbound passengers daily

The circulation diagram in **Figure 10** shows paths of travel from surface to platform, reflecting the design at the conclusion of Preliminary Engineering. During Final Design, the platform has been shifted in depth and longitudinal location. **Figure 11** shows a view of Chinatown Station at the point where passengers will offload onto the center platform. Both these graphics will be updated at the conclusion of Final Design, but are included here as representative.

Figure 10: Chinatown Station View of Center Platform (Prelim. Engingeering)

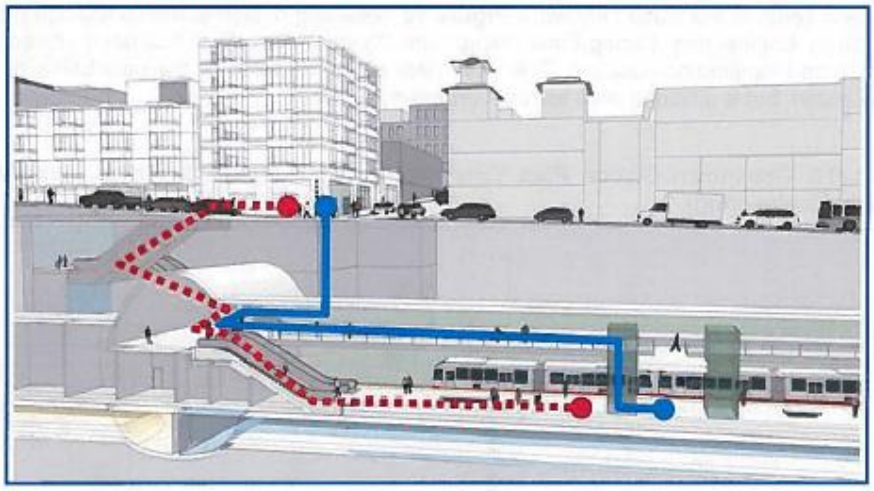
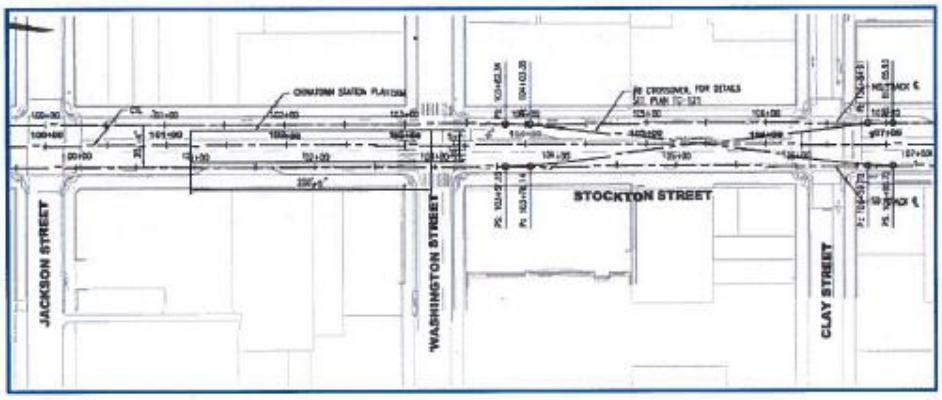


Figure 11: Chinatown Station View of Platform (Prelim. Engineering)

3.2.7 Turnback Operations and Storage at Chinatown

At the Chinatown Station, trains will be automatically routed by ATCS via the diamond crossover south of the station shown in **Figure 12**, reflecting design at the conclusion of Preliminary Engineering. During Final Design, the Chinatown platform has been shifted in depth and longitudinal location. This plan view will be updated at the conclusion of Final Design, but is included here as representative.

Figure 12: Chinatown Station Plan View including Crossover South of Platform (Prelim. Engineering)



Arriving trains will be preferentially routed to the southbound platform if it is available to expedite departures directly out of the station, instead of passing through the crossover after departing.

After offloading passengers, the operator will secure the cab and proceed to the other end of the train. When passengers have boarded, the operator will close the doors and ATCS will dispatch the train for the Market/Union Square Station via the crossover to the southbound track. Three minutes are allotted in the cycle time for the turnback operation.

Additional storage for cars is provided on each 200' tail track to the north of the station platform. If a train needs to be taken out of service, take a scheduled layover, or stored for special event service, it can be moved to the end of either of the tail tracks beyond the limit of ATCS control, without disrupting normal turnback operations. The operator will convert to "Manual Mode", pull the train forward without ATCS control into the tail track, secure the cab and walk back to the platform along the tunnel walkway.

The operator tunnel walkway back to platform will be fully functional with railings, lights and CCTV for security. A cross through passage way at the end of the tail track provides the option for operators to park one vehicle, cross to the adjacent tunnel and depart on another vehicle.

A bumper at the northern end of the tail track will prevent vehicles from travelling beyond the limits of the tail track.

Should a Phase 3 extension of the T-Line be constructed, relocating the terminus beyond the Chinatown tail track to or near Columbus Avenue would include the addition of a new double cross over that is standard on Muni Metro new terminals.

3.3 Running Time and Cycle Time

Running and cycle times for the long and short lines were based on a simulation of the Central Subway performed during Preliminary Engineering and summarized in the *Task 1.05-02 Travel Time Analysis for Modified Locally Preferred Alternative Working Paper, Rev. 0, February 21, 2007.* The results of the simulation were combined with existing T-Third alignment run times.

Long Line Round Trip Running Time: 64 minutes

Long Line Layover and Recovery Time: 19 minutes

Long Line Cycle Time: 83 minutes

Short Line Round Trip Running Time: 13 minutes

Short Line Layover and Recovery Time: 10 minutes

Short Line Cycle Time: 36 minutes

Running and cycle times will be reexamined with an updated simulation in 2011. See Section 7 of this Plan for more detail.

3.4 Hours of Operation

The CS hours of operation used for this Service Plan are the same as the current Metro Subway hours of 4:30 a.m. to 1:30 a.m. weekdays. Saturday service would begin about 5:30 a.m. and Sunday service would begin about 7:30 a.m. The ending times would remain the same as on weekdays.

The 91-Owl bus would provide service after the subway closes.

3.5 Service Pull-out and Pull-in

Pullout of the T-Line light rail vehicles from the Muni Metro East (MME) Rail Facility at 25th and Third Streets would begin at approximately 4:00 a.m.

The first train is a "sweep train" that allows the operator to perform a visual and operational check of the subway systems. Following trains proceed to the terminals to begin service.

Trains are dispatched from MME at the gates on 25th Street and Illinois Street and on Cesar Chavez Street. The half grand union switch arrangements at Third and 25th Streets allow operators to use the train-to-wayside communications to select the desired route when they are on 25th Street approaching Third Street.

LRVs pull out in both directions on Third Street to provide service to the Central Subway and to the Bayshore Station. In addition to Central Subway trains, LRVs serving other rail lines and the Metro Subway would also pull out at the same time and proceed north on Third Street.

Trains pull in to MME via 25th Street or Cesar Chavez Street. The half grand union switch arrangement at Third and 25th Streets allows operators to use the train-to-wayside communications to select the route when they are on Third Street.

3.6 Number of Cars in Consists

One-car trains are currently used on the Phase 1 service. Short street block lengths on Third Street limit the surface platforms to about 160 feet, which can accommodate a maximum train length of 2 cars. These block length limits apply at 4th/Berry, Mission Bay Loop, and all stations south of MME.

Two-car trains are the longest consist used on all other light rail surface service, based on the current Metro operational practice.

Two-car trains are also the longest consist that can be used based on the current Automatic Train Control System. The train control and platforms can also accommodate two 1-car trains at each station.

For these reasons, Central Subway platforms are designed for lengths of about 200 feet, accommodating a maximum consist of 2 cars. Two-car consists are the maximum train length used in the service plans.

4.0 2018 Opening Year Service Plan

This service plan uses:

2-car consists for the Long Line between Chinatown and Bayshore.

2-car consists for the Short Line between Chinatown and Mission Bay Loop.

7.5 minute headways on both lines.

The combination of long line and short line at these headways provides 16 train trips per hour in the subway, or a 3.75 minute headway.

Figure 13 summarizes the 2018 service plan:

Figure 13: 2018 Central Subway Service Plan

Project 2018 Plan

Line	From Terminus	To Terminus	Cycle Time minutes	Distance miles	Day	---Headway--- Peak	Midday	Eve.	Night	---Consist--- Peak	OffPk	Peak LRVs
T	Bayshore Terminus	Stockton Washington	83	6.87	M-F	7.5	10.0	12.0	20.0	2	1	23
					Sat	na	10.0	10.0	20.0		1	
					Sun	na	10.0	15.0	20.0		1	
T-c	19th/3rd Mission Bay	Stockton Washington	36	2.90	M-F	7.5	10.0	na	na	2	1	10
					Sat	na	na	na	na			
					Sun	na	na	na	na			
										TOTAL		33

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4.1 2018 Capacity Analysis

The 2010 ridership estimates for 2018 show 43,521 average daily boardings with a peak hour load of 3,120 passengers.

Figure 14 shows that the 3.75-minute subway headway provides capacity for 3,232 riders per hour, satisfying the 2018 projected peak hour maximum load point (MLP) ridership at the Union Square Market Street Station (UMS) station of 3,120 riders.

Figure 14: 2018 Capacity for Long line and Short line

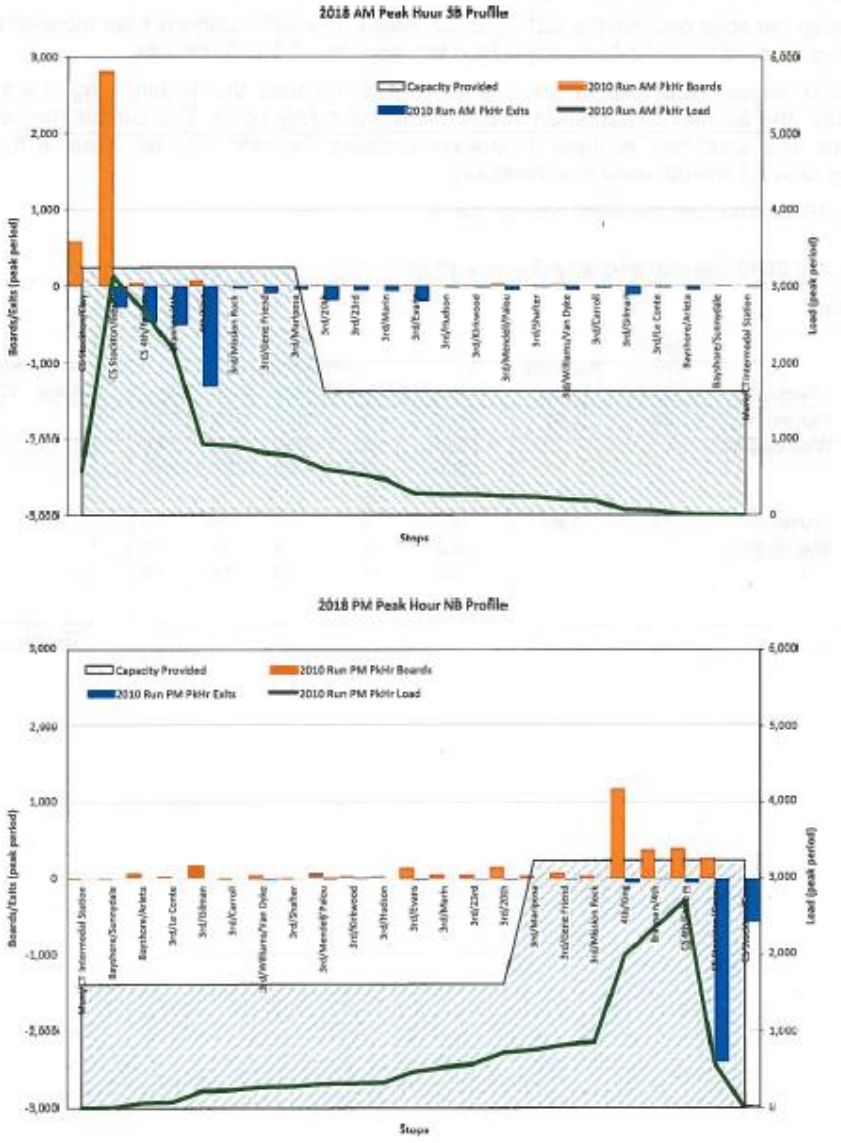
Bayshore Line and Mission Bay Loop 2018 Service Factors	Capacity with 7.5/7.5 minute Headways
Total Projected Daily Boardings for T-Third Line	43,521
Projected Peak Hour Demand at UMS AM Peak MLP	3,120
Cars / hour @ 7.5 min Long Line 2 cars	16
Cars / hour @ 7.5 min Short Line 2 cars	16
Total LRV car trips per hour	32
LRV Capacity passengers per car	119
LRV Capacity at 85% avg. load – see note below [1]	101
CS Peak Hour Capacity @ 85% avg.	3,232
% Capacity provided	>100%

Notes

1) The SFMTA Service Planning best practice is to use the peak hour demand to design service capacity.

The 1-hour time frame in the service plan capacity analysis uses the SFMTA standard of 85% of 119 passengers as a maximum load for planning purposes or 101 passengers. This capacity reduction ensures sufficient capacity to handle variations in passenger flows, and is equivalent to using a Peak Hour Factor of .85.

Figure 15: 2018 Peak Hour, Peak Direction Passenger Load Profiles



5.0 2030 Design Year Service Plan

Expanding capacity beyond the 2018 service levels, the 2030 Service Plan increases peak frequency (decreases headways) for each loop from 7.5 to 5 minutes.

The 2030 service continues to use a 2-car consist for both the T-Third long line to Bayshore and for the T-Third short line to the Mission Bay Loop. The combination of long line and short line at these headways provides 24 train trips per hour in the subway, or a 2.5 minute combined headway.

Figure 16 summarizes the 2030 service plans.

Figure 16: 2030 Central Subway Service Plan

Project 2030 Plan

Line	From Terminus	To Terminus	Cycle Time minutes	Distance miles
T	Bayshore Terminus	Stockton Washington	83	6.87
T-s	19th/3rd Mission Bay	Stockton Washington	36	2.90

	---Headway---			
Day	Peak	Midday	Eve.	Night
M-F	5.0	10.0	12.0	20.0
Sat	na	10.0	10.0	20.0
Sun	na	10.0	15.0	20.0
M-F	5.0	10.0	na	na
Sat	na	na	na	na
Sun	na	na	na	na

---Consist---		Peak
Peak	OffPk	LRVs
2	2	34
	1	
	1	
2	2	15
	TOTAL	49

5.1 2030 Capacity Analysis

The 2010 ridership estimates for 2030 show 64,620 average daily boardings with a peak hour load of 4,840 passengers.

The 2.5-minute subway headway, with 2-car trains provides capacity for 4,848 riders per hour, satisfying the 2030 projected peak hour maximum load point (MLP) ridership as shown in **Figure 17**.

Figure 17: 2030 Capacity Analysis

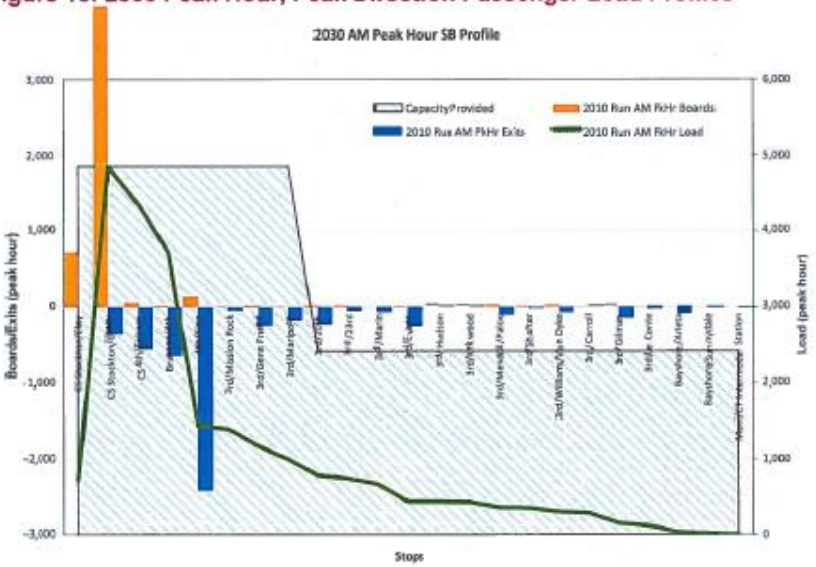
Bayshore Line and Mission Bay Loop 2030 Service Factors	With 5/5 min. Headways
Total Projected Daily Ridership for T-Third Line	64,620
Projected Peak Hour Demand at UMS AM Peak MLP	4,840
Cars per hour @ 5 min (Long Line) 2 cars	24
Cars per hour @ 5 min (Short Line) 2 cars	24
Total LRV car trips per hour	48
LRV Capacity (passengers per car – see note below.	119
LRV Capacity at 85% avg. load	101
CS Peak Hour Capacity @ 85% avg.	4,848
% Capacity provided	>100%

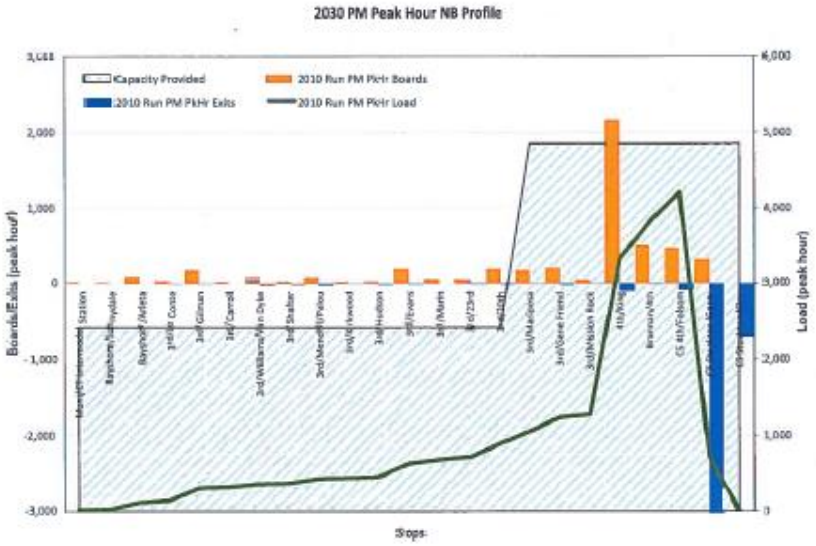
Notes

1) The SFMTA Service Planning best practice is to use the peak hour demand to design service capacity.

The 1-hour time frame in the service plan capacity analysis uses the SFMTA standard of 85% of 119 passengers as a maximum load for planning purposes or 101 passengers. This capacity reduction ensures sufficient capacity to handle variations in passenger flows, and is equivalent to using a Peak Hour Factor of .85.

Figure 18: 2030 Peak Hour, Peak Direction Passenger Load Profiles





6.0 Operating Data and Light Rail Vehicle Fleet Plan

Figure 19 shows the opening and design year peak vehicle requirements for the respective service plans.

Figure 19: T-Third Peak Vehicles at Opening and Design Year

Service Milestones	T-Third Peak LRVs
2011 K/T Route Scheduled Service	20
2018 Opening Year Service	32
2030 Design Year Service	48

Figure 20 shows the LRV fleet requirements by year, based on the 2010 SFMTA Fleet Plan. The SFMTA is currently engaged in planning for the vehicle procurement shown in Fiscal Years 2019-2020. The LRV Procurement Plan, approved by the SFMTA and submitted to the FTA in February 2011, outlines the schedule for policy decisions and identifications of funding sources that will be required to support the acquisition of these vehicles in time for revenue service in the fiscal years shown below.

Figure 20: Agency 20-Year Fleet Plan - FY2014 – FY2020 Excerpt

Light Rail Fleet Demand	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20
Smoothed Planning Estimate of Peak Vehicle Demand	128	132	135	139	143	147	150
Maintenance Demand	30	26	27	28	30	32	31
Total: Fleet Size Demand	158	158	162	167	173	179	181

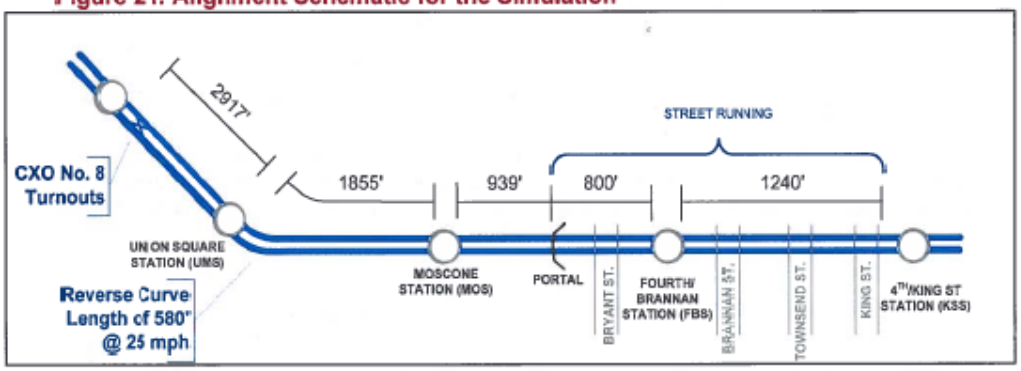
Light Rail Fleet Supply	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20
Present Breda fleet	151	151	151	151	151	151	151
Expansion fleet 2016–18 Procurement	0	0	0	0	0	12	24
Total: Planned Revenue Fleet	151	151	151	151	151	163	175

Source: 2010 SFMTA Transit Fleet Management Plan and LRV Procurement Plan.

7.0 2010 Phase 1 + 2 Simulation

Initial simulation from north of the Fourth and King intersection to the Chinatown turnback was performed as part of task 1.05-02, New Central Subway Operations Plan, during preliminary engineering. Simulation of the selected alignment was presented in *Travel Time Analysis for Modified Locally Preferred Alternative Working Paper*, dated February 21, 2007. The Project alignment schematic that illustrates the focus of simulation is shown in **Figure 21**.

Figure 21: Alignment Schematic for the Simulation



Additional modeling was performed for use in the analysis of Section 5. Using observed travel times from the IOS segment of the T-Third line and the in-tunnel travel times from the previous modeling, a new model of the surface alignment was created in VisSim software to update overall travel times. These run times and cycle times are summarized in Section 3.3.

7.1 2010 Simulation

In 2010, the T-Third alignment was included in an SFMTA pilot project using SYSTRA, Inc.'s RailSim software. The results of this simulation were reported in a Technical Memorandum dated April 5, 2010. The Table of Contents and Executive Summary of the Technical Memorandum are included as Appendix C.

The simulation used the 2009 service plans as a basis. The model found running times slightly greater than planned, but the SYSTRA recommendations did not suggest altering the planned times. Rather, the report recommended addressing several sources that contributed to delays. The service plan was revised taking the recommendations of the report into account.

The subsequent changes in service that responded to several key sources of delay, including elimination of the "Tripper" service. After review of the simulation, SFMTA

determined that the currently assumed cycle and running times were reasonable. A future simulation, described in the next section, will be performed to confirm the effectiveness of changes.

7.2 Future Simulation

A further simulation will be used to confirm that the updated service plans achieve the expected running times and resolve the delays. This final simulation will be run during the second quarter of 2011, using completed Final Design track alignment drawings, to account for any changes in the project geometry.

The simulation will include study of the system capacity at the locations identified as bottlenecks: the Chinatown Turnback, and the 4th and King intersection.

The simulation will be conducted in collaboration with the SFMTA Transit Operations, Service Planning, and Transit Engineering. At that time, more detailed scheduling of runs will be determined, including finalization of turn-around, layover, and schedule recovery time.

The Simulation Report will include a sensitivity analysis to test capacity constraints. The model may also be used to test special event scenarios and options for number of vehicles pulling out from the Metro East facility to the T and other lines.

8.0 Service Plan Reference Documents

A list of the formal document names and publication dates of key capacity analysis references that will be used. Examples:

1. Task 1.05-02 Travel Time Analysis for Modified Locally Preferred Alternative Working Paper, Rev. 0, February 21, 2007.
2. Central Subway Operating Plan Additional Service Option 2030, Draft Rev. 1c, May 14, 2009.
3. Technical Memorandum – Muni Central Subway Network Simulation Analysis, Prepared by SYSTRA Consulting, Inc., April 5, 2010.
4. Station Capacity Analysis.
5. The Fire Life Safety Analysis for the subway stations.
6. The OCS power capacity analysis.
7. 2010 SFMTA Transit Fleet Management Plan, November 2010.
8. 2010 New Starts Report Financial Plan

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Appendices

Appendix A: Service Planning Spreadsheets

T-Line Service

	2018 loads	2030 loads	
AM Peak	3121	4840	SB from UMS
PM Peak	2708	4192	NB from MOS
AM Peak - Long Line	933	1655	NB from 20th
PM Peak - Long Line	724	1096	SB from Mariposa

Line	2018 Cycle Time	2030 Cycle Time	Per Car Design Capacity	
CS Short	37.5	35	85%	101
CS Long	82.5	85	65%	77
N increment	13			

*2018 Loads are from the V3 run: TEP, BRT, 7.5 minute headways both lines.
*2030 Loads are from the V5 run: TEP, BRT, no DTX, 5 minute headways both lines.

2018 Service Plan (proposed)	Headway (min)	Trains per Hour	Cars per Train	Cars per Hour	Peak Vehicles
short	7.5	8	2	16	10
long	7.5	8	2	16	22
			Total	32	32
N Line	5	12	2	24	6

	short	long
Total Cars	32	16
AM Loads per Car	98	58
PM Loads per Car	85	45
AM exceeds cap by	-4	-19
PM exceeds cap by	-17	-32

2030 Service Plan (proposed)	Headway (min)	Trains per Hour	Cars per Train	Cars per Hour	Peak Vehicles
short	5	12	2	24	14
long	5	12	2	24	34
very short					
			Total	48	48

	short	long
Total Cars	48	24
AM Loads per Car	101	69
PM Loads per Car	87	46
AM exceeds cap by	0	-8
PM exceeds cap by	-14	-32

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4th/Stockton Corridor Bus Service

	2018 loads	2030 loads	
AM Peak	964	908	SB from Stockton/Pacific
PM Peak	636	665	NB from Stockton/Clay

Line	Cycle Time	Per Car Design Capacity
30 Short	77	80
30 Long	108	80
45	96	54

*2018 Loads are from the V3 run: TEP, BRT, 7.5 minute headways both lines.
*2030 Loads are from the V5 run: TEP, BRT, no DTX, 5 minute headways both lines.

2018 Service Plan (proposed)	AM Headway (min)	AM cars per hour	AM vehicles	AM Per Hour Capacity	PM Headway (min)	PM cars per hour	PM vehicles	PM Per Hour Capacity
30 Short		0	0	0		0	0	0
30 Long	8	8	14	600	12	5	9	400
45	8	8	12	405	12	5	8	270
	Total	15	26	1005	Total	10	17	670
			AM exceeds cap by	-41			PM exceeds cap by	-34
			Or, per car:	-2.73333			Or, per car:	-3.4

2030 Service Plan (proposed)	AM Headway (min)	AM cars per hour	AM vehicles	AM Per Hour Capacity	PM Headway (min)	PM cars per hour	PM vehicles	PM Per Hour Capacity
30 Short		0	0	0		0	0	0
30 Long	8	8	14	600	12	5	9	400
45	8	8	12	405	12	5	8	270
	Total	15	26	1005	Total	10	17	670
			AM exceeds cap by	-97			PM exceeds cap by	-5
			Or, per car:	-6.46667			Or, per car:	-0.5

Appendix B: Ridership from SFCTA Models

Muni Central Subway

Boardings & Passenger Miles

2018 Forecast

IOS+CS	AM	MD	PM	EV	OWL	DAILY TOTAL	ANNUAL TOTAL
MUNI SYSTEMWIDE							
Period Boardings	240,027	256,974	214,522	134,384	10,486	**856,393**	**273,189,367**
Period Passenger Miles	485,899	462,259	401,117	227,904	23,727	**1,600,906**	**510,689,014**
Peak Hour Boardings	105,612	46,255	79,373	29,564	6,082		
Peak Hour Passenger Miles	213,796	83,207	148,413	50,139	13,762		
T							
Period Boardings	9,749	7,565	8,729	2,880	0	**28,923**	**9,226,437**
Period Passenger Miles	19,143	18,737	18,185	8,590	0	**64,655**	**20,624,945**
Peak Hour Boardings	4,290	1,362	3,230	634	0		
Peak Hour Passenger Miles	8,423	3,373	6,728	1,890	0		
T-Short Line							
Period Boardings	6,016	3,391	5,191	0	0	**14,598**	**4,656,762**
Period Passenger Miles	5,832	3,294	4,920	0	0	**14,046**	**4,480,674**
Peak Hour Boardings	2,647	610	1,921	0	0		
Peak Hour Passenger Miles	2,566	593	1,820	0	0		
TOTAL (T+TS)							
Period Boardings	15,765	10,956	13,920	2,880	0	**43,521**	**13,883,199**
Period Passenger Miles	24,975	22,031	23,105	8,590	0	**78,701**	**25,105,619**
Peak Hour Boardings	6,937	1,972	5,150	634	0		
Peak Hour Passenger Miles	10,989	3,966	8,549	1,890	0		

IOS	AM	MD	PM	EV	OWL	DAILY	ANNUAL
MUNI SYSTEMWIDE							
Period Boardings	236,791	255,068	211,208	133,774	10,487	**847,328**	**270,297,632**
Period Passenger Miles	486,241	475,252	401,675	232,250	23,510	**1,618,928**	**516,438,032**
Peak Hour Boardings	104,188	45,912	78,147	29,430	6,082		
Peak Hour Passenger Miles	213,946	85,545	148,620	51,095	13,636		

CHANGE	AM	MD	PM	EV	OWL	DAILY	ANNUAL
MUNI SYSTEMWIDE							
Period Boardings	3,236	1,906	3,314	610	-1	**9,065**	**2,891,735**
Period Passenger Miles	-342	-12,993	-558	-4,346	217	**-18,022**	**-5,749,018**
Peak Hour Boardings	1,424	343	1,226	134	-1		
Peak Hour Passenger Miles	-150	-2,339	-206	-956	126		
						Annualization Factor	319

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Muni Central Subway

Boardings & Passenger Miles

2030 Forecast

IOS+CS	AM	MD	PM	EV	OWL	DAILY TOTAL	ANNUAL TOTAL
MUNI SYSTEMWIDE							
Period Boardings	253,687	274,232	230,937	146,997	11,723	917,576	292,706,744
Period Passenger Miles	508,869	462,259	401,117	227,904	23,727	1,623,876	518,016,444
Peak Hour Boardings	111,622	49,362	85,447	32,339	6,799		
Peak Hour Passenger Miles	223,902	83,207	148,413	50,139	13,762		
T							
Period Boardings	14,817	10,171	13,224	4,478	0	42,690	13,618,110
Period Passenger Miles	30,143	25,112	26,980	12,357	0	94,592	30,174,848
Peak Hour Boardings	6,519	1,831	4,893	985	0		
Peak Hour Passenger Miles	13,263	4,520	9,983	2,719	0		
T-Short Line							
Period Boardings	9,069	4,712	8,149	0	0	21,930	6,995,670
Period Passenger Miles	9,253	4,998	8,152	0	0	22,403	7,146,557
Peak Hour Boardings	3,990	848	3,015	0	0		
Peak Hour Passenger Miles	4,071	900	3,016	0	0		
TOTAL (T+TS)							
Period Boardings	23,886	14,883	21,373	4,478	0	64,620	20,613,780
Period Passenger Miles	39,396	30,110	35,132	12,357	0	116,995	37,321,405
Peak Hour Boardings	10,510	2,679	7,908	985	0		
Peak Hour Passenger Miles	17,334	5,420	12,999	2,719	0		

IOS	AM	MD	PM	EV	OWL	DAILY	ANNUAL
MUNI SYSTEMWIDE							
Period Boardings	247,683	271,047	225,127	145,849	11,724	901,430	287,556,170
Period Passenger Miles	508,172	504,891	427,951	254,206	25,754	1,720,974	548,990,706
Peak Hour Boardings	108,981	48,788	83,297	32,087	6,800		
Peak Hour Passenger Miles	223,596	90,880	158,342	55,925	14,937		

CHANGE	AM	MD	PM	EV	OWL	DAILY	ANNUAL
MUNI SYSTEMWIDE							
Period Boardings	6,004	3,185	5,810	1,148	-1	16,146	5,150,574
Period Passenger Miles	697	-42,632	-26,834	-26,302	-2,027	-97,098	-30,974,262
Peak Hour Boardings	2,642	573	2,150	253	-1		
Peak Hour Passenger Miles	307	-7,674	-9,929	-5,786	-1,176		
						Annualization Factor	319

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Appendix C: 2010 Simulation Report – Executive Summary

Muni Rail Core Muni Central Subway	
April 5, 2010	Rev. Number 1.0
Approved By: Alan Foster	
SYSTRA Job No. C0578200	
Project Name: Muni Rail Core Capacity and Reliability	

San Francisco Municipal Transportation Agency
Muni Rail Core Capacity and Reliability Analysis

(SFMTA Contract No SFMTA 2008-02; SYSTRA Project C0578200)

Technical Memorandum

Muni Central Subway
Network Simulation Analysis

Prepared by:

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Rev. 1

March 2011

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San Francisco Municipal Transportation Agency
(SFMTA Contract No SFMTA 2008-02; SYSTRA Project C0578200

Muni Rail Core Capacity and Reliability Muni Central Subway

Draft Report

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1. Executive Summary

This report presents the results of simulations of Muni's 2030 Service Plan for the T-Third Line and proposed Central Subway. These simulations evaluated projected AM and PM peak-period schedules including new T-Third Line services that would operate into the Central Subway. N-Judah trains were included, as were all trains pulling into or out of the Muni Metro East (MME) facility, in order to capture the full network effect of the interactions between trains operating over these various routes.

The simulation results indicate that there are significant issues with the proposed operation, in terms of on-time performance, running time, and throughput.

The intersection at 4th and King Streets creates a bottleneck for the simulation territory and causes significant queuing of trains. As a result, the headway intended in the service plan can barely be sustained. In order to provide more reliable service, the volume of trains would have to be reduced or the intersection would have to be improved. (On the other hand, the rest of the network appears to handle the high train volume relatively well, but that could be in part thanks to the 4th/King intersection acting as a headway regulator.)

Moreover, the scheduled recovery provided in the operating plan in order to respect the equipment requirements of the service plan was not sufficient to allow all trains to make up for lost time. If the train volume were reduced, the run times would most probably also be reduced, meaning that the lower recovery could be acceptable.

As a first step, the same T-Third operating plan could be tested with some adjustments: removing the pull-outs to other lines past 6:30 AM, increasing recovery time at the street terminals, and permitting double-berthing at the 4th/Berry station. Although this scenario would require more vehicles and would not likely eliminate the queue at the intersection of 4th and King Streets, on-time performance would probably be improved and the service plan headways maintained.

Another option would be to test the operating plan with a higher T-Third headway, but without double-berthing and retaining the current pull-out schedule. The would be expected to improve on-time performance without increasing the vehicle requirement, but at the expense of passenger capacity.

Appendix D: T-Third Phase 1 Start-Up & Operating Plan Executive Summary

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1.00.00 EXECUTIVE SUMMARY

The San Francisco MTA is completing the construction of a new Light Rail line to provide service along Third Street between Visitacion Valley and Chinatown. The Third Street Light Rail Program has two major construction phases. Phase I, the Initial Operating Segment (IOS), is a 5.4-mile surface extension of the Muni Metro Light rail system extending service from 4th and King Streets along Third Street and terminating in Visitacion Valley. It is scheduled to begin in early 2007. As part of the IOS service plan, Muni bus service in and around Third Street and Downtown will be modified to a network with the new light rail line. To support the expansion of rail service, a new Muni Metro East (MME) Rail Division at 25th Street and Illinois Street is scheduled for completion in late 2008.

Phase II of the Third Street Rail Program will extend the IOS from King Street via the Central Subway (CS) to provide a direct rail connection from Visitacion Valley to Chinatown. The CS will extend from portals at Harrison Street, under Fourth Street, Geary and Stockton Streets to a terminal at Stockton and Clay streets. The CS Phase will construct three subway stations. Initial engineering for the CS is currently underway. Revenue service for the CS is projected for 2016.

Completion of the capital projects on the Third Street corridor represents a public investment of over $2 billion. The work required to implement this growth and change is quite significant, equivalent to starting up a new light rail transit system. As the startup date for the IOS approaches, careful planning and scheduling is required to implement this growth and change smoothly and successfully.

1.01.00 PURPOSE OF THE PLAN

This Initial Operation Segment Operations Plan (IOSOP) serves as the principal source document to define the transition of the project from construction to operations, and the operations and maintenance practices necessary to implement the projects in a safe, dependable and efficient manner. The scope of this document is limited to the opening of the IOS. Revenue service is scheduled to begin in Spring 2007, which will occur about 2 years in advance of MME Facility opening. Metro East and Central Subway startups will be addressed in separate operating plans. The IOSOP is intended to:

- Identify all requirements for the start-up of IOS revenue service, and describe the relationships among them.
- Identify existing Muni systems, rules and procedures impacted by IOS revenue service, and facilitate any required changes.

- Establish a rational, phased approach for service as the Third Street project transitions from construction to revenue operation and is integrated into existing Metro service.
- Establish a mutual understanding among MUNI personnel as to the operating and financial impacts of the project.
- Identify impacts to other existing Muni service.

The IOS Start-Up Committee is comprised of staff from Operations, Schedules, Service Planning, Vehicle and Facilities Maintenance, Construction, System Safety, Communications, Finance, DPT, and the Executive Director's Office. Subcommittees have been meeting regularly for over two years to identify issues and develop specific testing, training and outreach plans. The work of this Committee provides the foundation for this document.

The full Start-Up committee convened in March 2006 to include other affected Muni departments and address agency-wide all the issues and areas related to the start up of the service. This committee is chaired by the Deputy General Manager of Operations.

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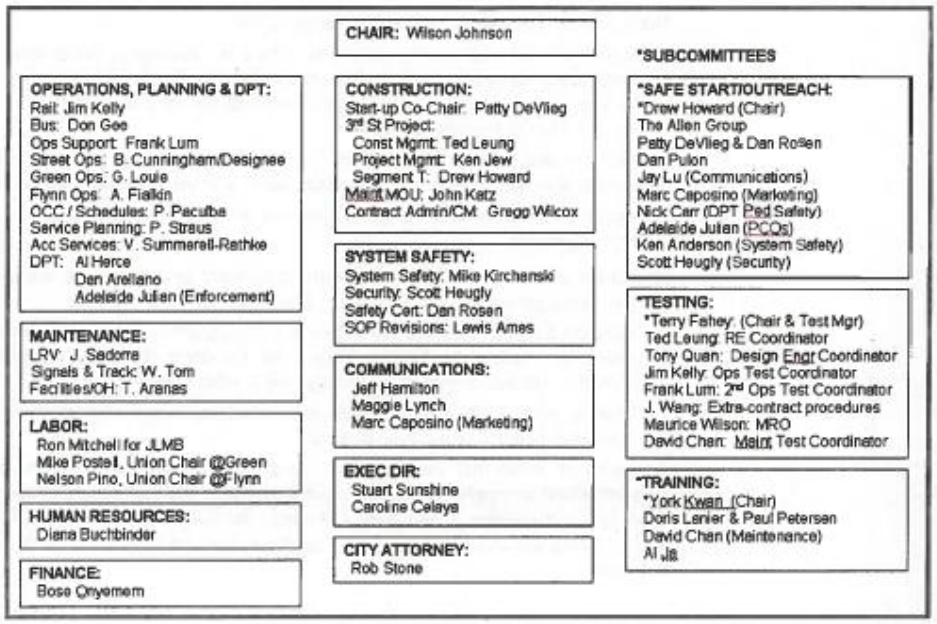

IOS Start-Up Committee
Figure 1-1

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The Subcommittees to the Start-Up Committee are:

- Safe Start and Community Outreach, which is developing the program of introducing service in a safe and secure manner, and how the community will be kept informed of startup-related issues and the safe introduction of rail service into the neighborhood;
- Start-Up test Coordination, which is preparing, reviewing and conducting system tests and preparing for simulated service to insure smooth operation;
- Training, which is developing the program for training rail operators on the new alignment.

In addition to the agency-wide IOS Start-Up Committee and its subcommittees, other working groups are also addressing issues related to the start up:

- Start-Up Critical Construction Dates is a Construction Division committee which is meeting regularly to coordinate the completion of construction activities, contractor-provided training, and system turnover.
- Muni's Safety Certification Committee is the body which oversees the FTA mandated Safety Certification process.

A number of issues that are beyond the scope of the Third Street project have been identified as impacting the Revenue Start date. To facilitate resolution of those issues a number of planning *charrettes* facilitated by a consultant were held. During the course of the planning *charrettes*, the following issues were addressed:

- LRV storage and the Satellite Yard Location
- The rail operating plan and LRV projected pullout and operator requirements
- Schedule requirements for hiring and training vehicle operators:
  - New hires trained for bus operations
  - New-to-rail operators moving from bus/trolley modes to rail at the next sign-up
  - LRV operator training specifically on the 3rd Street alignment
- Setting priorities for hiring, given the FY07 budget for 3rd St, and resolving which maintenance, operations, security support positions can be hired & trained
- Recommending a revenue service start date
- Developing a limited service "soft launch" program

1.02.00 ORGANIZATION OF THE PLAN

Remaining sections of the IOSOP are organized as follows:

Chapter 2 – Third Street Light Rail Project identifies and describes all the elements of the Third Street Program: The Initial Operating Segment (IOS), the Muni Metro East Division and Maintenance Facility (MME), and the Central Subway (CS). Its main focus will be the implementation of the IOS in Spring 2007. It identifies the current implementation schedule for the IOS project

segments, and describes implementation issues for the IOS that may affect existing operations and maintenance practices.

Chapter 3 – Operating and Service Plans describes the Third Street IOS proposed operations. The plans describe the proposed plan for both rail and bus service. It also describes a "soft launch" introductory service that will be implemented prior to full revenue service.

Chapter 4 – Testing, Training and Safety Requirements outlines the testing and training program for the IOS as well as an overview of the Safety Certification activities. For testing, this chapter covers system integration testing and simulated revenue testing leading up to revenue service. For training, this chapter covers training requirements and plans for both Operations and Maintenance staff.

Chapter 5 - Operating and Maintenance Costs presents the operating and maintenance (O&M) cost assumptions and order-of-magnitude cost estimates for each operating plan and operations and maintenance support requirements and staffing levels.

Exhibit A – Start-up Activities shows the spreadsheet in which the start-up tasks are tracked and managed. This chart is a "living document" which continuously changes as the Start-Up Committee conducts its work.

Exhibit B – Start-Up Schedule shows the Start-Up schedule of activities, with interdependencies.

Exhibit C – Start-Up Budget shows the anticipated costs of Start-Up, and indicates funding sources and anticipated cash flow.

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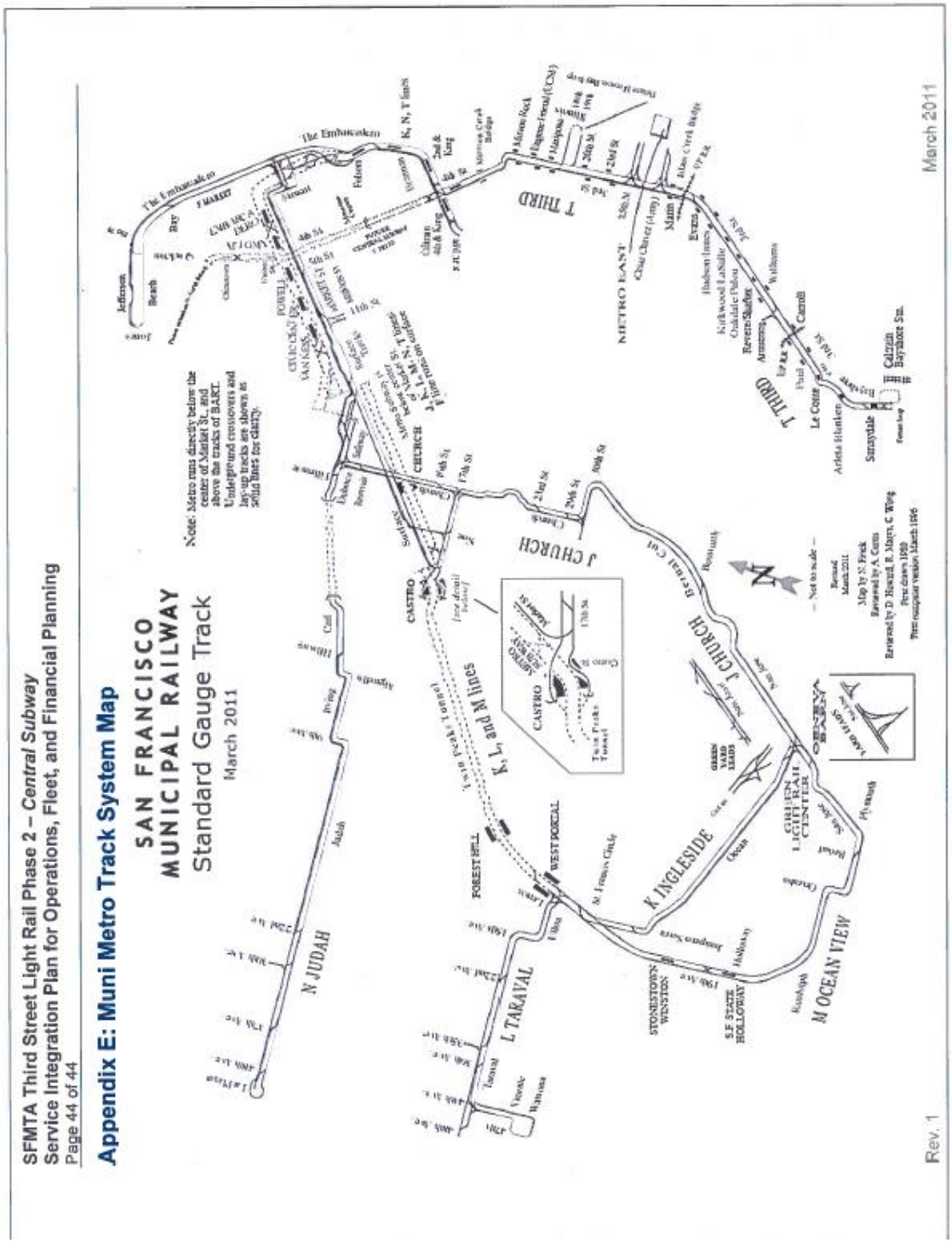
SFMTA Third Street Light Rail Phase 2 – Central Subway
Service Integration Plan for Operations, Fleet, and Financial Planning
Page 44 of 44
Appendix E: Muni Metro Track System Map
SAN FRANCISCO
MUNICIPAL RAILWAY
Standard Gauge Track
March 2011
Note: Metro runs directly below the center of Market St., and above the tracks of BART. Underground crossovers and lay-up tracks are shown as solid lines for clarity.
T THIRD
METRO EAST
J CHURCH
K, L, and M lines
CASTRO
FOREST HILL
WEST PORTAL
K INGLESIDE
N JUDAH
L TARAVAL
M OCEAN VIEW
STONESTOWN
S.F. STATE
HOLLOWAY
CITY COLLEGE
Not to scale
March 2011
Rev. 1

Appendix H

SFMTA BOARD RESOLUTION TO LEASE PAGODA PALACE SITE

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SFMTA BOARD RESOLUTION TO LEASE PAGODA PALACE SITE

THIS PRINT COVERS CALENDAR ITEM NO. 11

SAN FRANCISCO MUNICIPAL TRANSPORTATION AGENCY

DIVISION: Finance and Information Technology

BRIEF DESCRIPTION:

Authorizing the Director of Transportation to execute a two-year lease (Lease), as tenant, with The Palace at Washington Square (Owner) for the premises at 1731-1741 Powell Street and 601 Columbus Avenue (Property), for an annual rent of $400,000 plus reimbursement of certain Owner costs, not to exceed $2,350,000 related to the SFMTA's use of the Property to build the Central Subway Project tunnel; and approving total expenditures resulting from use of the Property to facilitate tunnel construction in an amount not to exceed $9,150,000, including total Lease costs not to exceed $3,150,000 and total additional demolition, design, construction and related costs not to exceed $6,000,000.

SUMMARY:

- On August 19, 2008, the SFMTA Board of Directors approved the Project's Alternative 3B, Fourth /Stockton Alignment, which included a variant to extend the tunnel to a North Beach tunnel boring machine (TBM) Retrieval Shaft on Columbus Avenue.
- After some members of the North Beach neighborhood expressed concerns about the construction disruption caused by TBM extraction in Columbus Avenue, the Project evaluated alternative TBM removal options, and on December 4, 2012, the SFMTA Board of Directors adopted a motion directing the Project to pursue "Option 4," which provides for removal of TBMs at the Property, if it was feasible and did not require a supplemental or subsequent environmental impact report.
- On January 31, 2013, the City's Planning Department determined that Option 4 would not require a supplemental or subsequent environmental impact report, and issued an addendum to the 2008 SEIS/SEIR.
- Staff requests approval to enter into a two year lease for the Property, under which the SFMTA will: demolish the existing building, pay Owner annual rent of $400,000 per year, reimburse the Owner for certain out of pocket costs arising from the SFMTA's use up to $450,000, reimburse the Owner for actual construction cost increases that result from delaying Owner's future project construction in an amount up to $1,500,000, and reimburse the Owner for its actual costs to backfill, and remove a portion of the Excavation Shaft, in an amount up to $400,000 for total Lease related costs not to exceed $3,150,000.
- Staff also seeks Board approval to make expenditures not to exceed $6 million for design, demolition, construction and related costs to implement Option 4 to retrieve the TBMs.

ENCLOSURES:

1. SFMTAB Resolution
2. Lease and Exhibits

APPROVALS: **DATE**

DIRECTOR _____ 2/15/13

SECRETARY R. Boomer 2/15/13

ASSIGNED SFMTAB CALENDAR DATE: February 19, 2013

PAGE 2

PURPOSE

Authorizing the Director of Transportation to execute a two-year lease (Lease), as tenant, with The Palace at Washington Square (Owner) for the premises at 1731-1741 Powell Street and 601 Columbus Avenue (Property), for an annual rent of $400,000 plus reimbursement of certain Owner costs, not to exceed $2,350,000 related to the SFMTA's use of the Property to build the Central Subway Project tunnel; and approving total expenditures resulting from use of the Property to facilitate tunnel construction in an amount not to exceed $9,150,000, including total Lease costs not to exceed $3,150,000 and total additional demolition, design, construction and related costs not to exceed $6,000,000.

GOAL

This lease will further the following goal and objective of the SFMTA's Strategic Plan

Goal 3 – Improve the environment and quality of life in San Francisco
Objective 3.3 Allocate capital resources effectively

BACKGROUND

The Project is the second phase of the SFMTA's Third Street Light Rail Project. The Central Subway design consists of a short portion of in-street surface light rail from the Caltrain Station to Bryant Street, before transitioning into subway operation for most of the alignment. The subway will consist of twin bore tunnels, with three subway stations serving the Yerba Buena/Moscone, Union Square/Market Street, and Chinatown areas. The running tunnels will be constructed using tunnel boring machines (TBMs).

The Project, as currently approved, would extend the Project tunnels to a retrieval shaft located on Columbus Avenue. Due to recent community concern about the potential disruption that would result from constructing and using the planned Columbus Avenue retrieval shaft, Project staff considered alternative options. "Option 4", which would place the TBM retrieval shaft at the Property, will address the construction concerns of the North Beach community without significantly impeding any future extension of rail service to North Beach/Fisherman's Wharf. Option 4 requires a lease of the Property for the TBM retrieval shaft and the Project's TBM removal activities and uses, which would include demolishing the existing building, constructing an excavation shaft, and removing the two TBMs.

Owner currently has a Conditional Use Permit (Case No. 2007-1117.CV) to rehabilitate the existing building at the Property into a mixed use development (Approved Owner Project). If the existing building at the Property is demolished for the TBM retrieval shaft, Owner wants the right to develop its project with new construction (Revised Owner Project). To allow for the construction of the Revised Owner Project, Owner would need the Board of Supervisors

to adopt a special use district ordinance, which can be found in Board File No. 130019, submitted on January 8, 2013, with substitute legislation submitted on January 29, 2013 (SUD Ordinance), and for the City's Planning Commission to approve a request for conditional use authorization (Case No. 2013-0050.CTZ), which was approved by the Planning Commission on February 14, 2013 (Modified CUP).

Lease Terms

The proposed Lease has a term of two years. Demolition of the existing building, and the commencement of annual rent payments, would occur only if, by April 1, 2013, the SUD Ordinance and Modified CUP become effective and the Federal Transit Administration determines that extracting the TBMs at the Property does not require supplemental environmental review under 23 CFR Section 771.130(c) of the regulations implementing the National Environmental Policy Act (NEPA). If those conditions are not timely met, either party would have the right to terminate the Lease. SFMTA would also have the right to immediately terminate the Lease if the beneficiary under the deed of trust encumbering the Property does not timely provide a consent and non-disturbance agreement to SFMTA, if SFMTA discovers any condition at the Property during the first six months of the Lease term that would delay completion of an excavation shaft at the Property by more than 30 days, or if any court issues an order interfering with the demolition of the building or the construction of the Excavation Shaft. The SFMTA may also terminate the lease on 120 days prior written notice to Owner for any other reason.

The SFMTA would pay rent to the owner. The annual rental rate would be $400,000 per year, based on SFMTA's use of the Property and Owner's lost opportunity costs incurred in delaying construction of the Approved Owner Project. SFMTA would also reimburse Owner as follows: (i) up to $450,000 for its out of pocket costs since December of 2012 to review SFMTA's proposed uses of the Property and to negotiate the Lease, to prepare a new conditional use authorization application for the Modified CUP, to make necessary modifications to its project plans to address the changed property conditions that will be caused by SFMTA's use of the Property, its property taxes for the Property during the term of the Lease, and the installation fee charged by SFMTA for any approved white zone or bulb-out that Owner is required to install as part of the Owner's Modified Project; (ii) up to $1,500,000 for construction cost increases for delaying the construction of Owner's Modified Project until the termination of the Lease, provided that Owner gets a site permit for the Owner's Modified Project during the time period specified in the Modified CUP; and (iii) up to $400,000 for removing a portion of the Excavation Shaft walls, and backfilling the Excavation Shaft, to accommodate the timely construction of the Owner's Modified Project. SFMTA would provide a refundable security deposit of $66,666.00 and, if required by Owner's lender or future construction lender to secure a construction loan for the Owner's Modified Project, a refundable deposit of $750,000 (Construction Account) to be used only for any Construction Cost Increase. Any funds in the Construction Account in excess of the determined Construction Cost Increase would be returned to SFMTA. SFMTA would pay for its own utilities, as well as any other services required at the Property for SFMTA's uses. SFMTA must install a construction fence around the Property before beginning any demolition of the existing building.

PAGE 4

If SFMTA installs the tunnel bores and the Excavation Shaft at the Property, it must do so in a manner that will support the Owner's Modified Project, as depicted in approved plans dated November 11, 2011. Prior to the termination or expiration of the Lease, SFMTA must install a concrete bulk head where the tunnel bores intersect the property boundary of the Property, install a cap on the Excavation Shaft at the current grade, and backfill any other excavation work by SFMTA (other than the Excavation Shaft). SFMTA will not be required to remove the Excavation Shaft or the tunnel bores.

Environmental Review

On August 7, 2008, the San Francisco Planning Commission certified in Planning Commission Motion No. 17668 that the Final Supplemental Environmental Impact Statement/Supplemental Environmental Impact Report (2008 SEIS/SEIR) for the Central Subway/Third Street Light Rail Phase 2 was prepared in compliance with the California Environmental Quality Act (California Public Resources Code section 21000, et seq.) (CEQA), the CEQA Guidelines, and Administrative Code Chapter 31. On August 19, 2008, under Resolution No. 08-150, the SFMTA Board of Directors adopted Project Alternative 3B, Fourth / Stockton Alignment with semi-exclusive surface rail operations on Fourth Street and the North Beach Construction Variant, which contemplated the eventual retrieval of TBMs from a retrieval shaft to be constructed on Columbus Avenue, and adopted the findings and conclusions with respect to the SEIS/SEIR certified by the San Francisco Planning Commission and required by CEQA. These findings included a mitigation monitoring and reporting program and a statement of overriding considerations.

On January 31, 2013, in an Addendum to the 2008 SEIS/SEIR, the City's Planning Department determined that removing the TBMs at the Property (Option 4), and allowing the construction of the Revised Owner Project, would not require a supplemental or subsequent EIR.

Construction and Demolition costs to access the Property

The SFMTA expects the construction methods at the new site to be the same as those planned, designed, vetted, and approved for the retrieval shaft on Columbus Avenue. Additional design, demolition, construction and related costs for implementing Option 4 are estimated to not exceed $6 million.

ALTERNATIVES CONSIDERED

The principal alternatives considered include leaving the TBM under Stockton Street or Columbus Avenue and the previously approved plan to remove the TBMs through an excavation shaft on Columbus Avenue.

FUNDING IMPACT

The lease will allow the SFMTA to demolish the building and use the site for retrieval of the TBMs. Key financial lease terms are as follows:

PAGE 5

- The SFMTA will pay the landlord $400,000 per year in rent.
- The SFMTA will reimburse the landlord up to $450,000 for certain out-of-pocket costs.
- The SFMTA will reimburse the landlord up to $1,500,000 for inflationary construction cost increases (if any) due to delaying its project.
- The SFMTA will reimburse the landlord up to $400,000 for partially removing and backfilling the SFMTA excavation shaft when the landlord builds its project.

The additional design, demolition, construction and related costs for implementing Option 4 are estimated to not exceed $6 million. The funding will come from various local sources, including SFMTA reserve funds, fund balance, and operating savings. Subject to FTA concurrence, the SFMTA proposes to seek reimbursement of these funds from any available Central Subway Project contingency funding at the completion of the Central Subway Project.

OTHER APPROVALS RECEIVED OR STILL REQUIRED

The City Attorney's Office has reviewed this Calendar Item. The Lease does not require approval from any other City agency or body.

RECOMMENDATION

Staff recommends that the SFMTA Board of Directors authorize the Director of Transportation to execute the Lease in substantially the form enclosed with this calendar item and to make any modifications to the Lease necessary or advisable to consummate the purposes and intent of the resolution that are consistent with all applicable laws and SFMTA Board policies and approve total expenditures resulting from use of the Property to facilitate tunnel construction in an amount not to exceed $9,150,000, including total Lease costs not to exceed $3,150,000 and total additional demolition, design, construction and related costs not to exceed $6,000,000.

SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
BOARD OF DIRECTORS

RESOLUTION No. _____

WHEREAS, On August 7, 2008, the San Francisco Planning Commission certified in Planning Commission Motion No. 17668 that the Final Supplemental Environmental Impact Statement/Supplemental Environmental Impact Report (SEIS/SEIR) for the Central Subway/Third Street Light Rail Phase 2 (Project) was in compliance with the California Environmental Quality Act (California Public Resources Code section 21000, et seq.) (CEQA), the CEQA Guidelines, and Administrative Code Chapter 31; and,

WHEREAS, On August 19, 2008, under Resolution No. 08-150, the Board of Directors of the San Francisco Municipal Transportation Agency (SFMTA) adopted Project Alternative 3B, Fourth / Stockton Alignment with semi-exclusive surface rail operations on Fourth Street and the North Beach Construction Variant, which contemplated the eventual retrieval of tunnel boring machines (TBMs) from a retrieval shaft to be constructed on Columbus Avenue, and adopted the findings and conclusions with respect to SEIS/SEIR certified by the San Francisco Planning Commission as required under CEQA, including a mitigation monitoring and reporting program and a statement of overriding considerations; and,

WHEREAS, Certain members of the North Beach community are concerned that the approved TBM retrieval shaft location will impede traffic on Columbus Avenue and disrupt businesses, and requested that the SFMTA evaluate options to removing the TBMs from the Columbus Avenue retrieval shaft location; and,

WHEREAS, One of the options evaluated, Option 4, removal of the TBMs at the property at 1731-1741 Powell Street and 601 Columbus Avenue (Property), will address the disruption on the North Beach community caused by the TBM removal shaft construction and operation, without impeding any future, but unplanned, extension of the T-Third to North Beach/Fisherman's Wharf; and,

WHEREAS, In order to not impact the Project construction schedule, implementation of Option 4 would require that additional local funds be appropriated, and that all review (including environmental review) and approvals be obtained by April 1, 2013; and,

WHEREAS, The SFMTA Board of Directors adopted a motion on December 4, 2012, directing SFMTA staff to pursue Option 4 if it was feasible; and,

WHEREAS, On January 31, 2013, in an Addendum to the 2008 Phase 2 Central Subway Supplemental Environmental Impact Report/Environmental Impact Statement for the SFMTA Third Street Light Rail Program, the City's Planning Department determined that Option 4, would not require a subsequent environmental impact report because none of the circumstances calling for a subsequent environmental impact report found in California Public Resources Code section 21166 have occurred; and,

WHEREAS, SFMTA staff anticipate that the increased construction costs for performing Option 4 rather than retrieving the TBMs at the approved retrieval shaft in Columbus Avenue will not exceed $6 million ; and,

WHEREAS, The Property owner, The Palace at Washington Square LLC (Owner), has a conditional use permit that allows the rehabilitation of the existing building at the Property into a mixed-use development (Owner's Approved Project), but SFMTA's construction of the TBM retrieval shaft at the Property (Excavation Shaft) would require full demolition of that building; and,

WHEREAS, The Owner submitted an application for a conditional use authorization to allow for the construction of Owner's Approved Project with new construction (Owner's Modified Project); and an ordinance amending the Planning Code to create a special use district and modify certain maps in the Planning Code (SUD/Map Ordinance), which would allow for the construction of Owner's Modified Project was submitted to the City's Board of Supervisors in Board File No. 130019 on January 8, 2013, and modified by substitute legislation submitted on January 29, 2013 (SUD Ordinance); and City's Planning Commission approved a conditional use authorization (Case No. 2013-0050.CTZ) for Owner's Modified Project (Modified CUP) and recommended that the Board of Supervisors adopt the SUD/Map Ordinance, on February 14, 2013; and,

WHEREAS, SFMTA staff and Owner negotiated a lease (Lease) that would allow SFMTA to construct the Excavation Shaft and extract the TBMs at the Property; and,

WHEREAS, The Lease has a term of two years, with annual rent commencing only if, by April 1, 2013, the SUD/Map Ordinance and the Modified CUP become effective and the Federal Transit Administration makes a written determination that extracting the TBMs from the Property requires no supplemental environmental review under 23 CFR Section 771.130(c) of the regulations implementing the National Environmental Policy Act (NEPA Finding); and,

WHEREAS, SFMTA would have the right to immediately terminate the Lease if the SUD/Map Ordinance and the Modified CUP do not become effective, and the NEPA Finding is not made, by April 1, 2013, if Owner's lender does not timely provide SFMTA with a consent and non-disturbance agreement, if a court of competent jurisdiction issues an injunction with regard to the demolition of the building or the construction of the Excavation Shaft, or if SFMTA learns of any adverse conditions at the Property during the first six months of the Lease term that would delay completion of the Excavation Shaft by more than 30 days, and SFMTA would further have the right to terminate the Lease for any other reason after first delivering no less than 120 days prior notice to Owner; and,

WHEREAS, The total annual rent for the Lease would be $400,000 per year, and SFMTA would reimburse Owner (i) up to $450,000 for its costs to review SFMTA's proposed uses of the Property and to negotiate the Lease, to prepare a new conditional use permit application for the Owner's Modified Project, to make necessary modifications to its project plans to address the changed property conditions that will be caused by SFMTA's use of the Property, to pay property taxes for the Property during the term of the Lease, and to pay the installation fee charged by SFMTA for any approved white zone or bulb out that Owner is required to install as part of the Owner's Modified Project; (ii) up to $1,500,000 for any

construction cost increases (Construction Cost Increase) caused by delaying the construction of Owner's Approved Project for the Lease, provided that Owner gets a site permit for the Owner's Modified Project during the time period specified in the Modified CUP; and (iii) up to $400,000 for removing a portion of the Excavation Shaft walls, and backfilling the Excavation Shaft, to accommodate the construction of the Owner's Modified Project; and,

WHEREAS, SFMTA would provide a refundable security deposit of $66,666 and a refundable deposit of $750,000 (Construction Account) to be used for the Construction Cost Increase if the Construction Account is required by Owner's lender or future construction lender to secure a construction loan for the Owner's Modified Project, with any funds in the Construction Account in excess of the determined Construction Cost Increase to be returned to SFMTA; and,

WHEREAS, The Lease has been placed with the Secretary to the SFMTA Board of Directors and has been available for public review since February 15, 2013, and the SFMTA Board of Directors has determined that delaying approval of the Lease until it has been available for public review for ten days would delay the commencement of retrieval shaft activities at the Property and cause Central Subway Project construction delays; now therefore be it

RESOLVED, That based on its review of the SEIS/SEIR and the Addendum dated January 31, 2013, the SFMTA Board of Directors finds that (1) modifications incorporated into the project will not require important revisions to the SEIS/SEIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects, (2) no substantial changes have occurred with respect to the circumstances under which the project will be undertaken which would require major revisions to the SEIS/SEIR due to the involvement of new environmental effects, or a substantial increase in the severity of effects identified in the SEIS/SEIR, and (3) no new information of substantial importance to the project has become available which would indicate (a) the project has significant effects not discussed in the SEIS/SEIR, (b) significant environmental effects will be substantially more severe, (c) mitigation measures or alternatives found not feasible which would reduce one or more significant effects have become feasible, or (d) mitigation measures or alternatives which are considerably different from those in the SEIS/SEIR would substantially reduce one or more significant effects on the environment; and adopts and incorporates by reference the findings adopted in SFMTA Board Resolution 08-150; and be it further

RESOLVED, That the SFMTA Board of Directors authorizes the Director of Transportation to execute a two-year lease (Lease), as tenant, with The Palace at Washington Square (Owner) for the premises at 1731-1741 Powell Street and 601 Columbus Avenue (Property), for an annual rent of $400,000 plus reimbursement of certain Owner costs, not to exceed $2,350,000 related to the SFMTA's use of the Property to build the Central Subway Project tunnel and to make any modifications to the Lease necessary or advisable to consummate the purposes and intent of this resolution that are consistent with all applicable laws and SFMTA Board policies; and be it further

RESOLVED, That the SFMTA Board of Directors approves total expenditures resulting from use of the Property to facilitate tunnel construction in an amount not to exceed $9,150,000, including total Lease costs not to exceed $3,150,000 and total additional demolition, design, construction and related costs not to exceed $6,000,000 to be funded from SFMTA reserves,

fund balance and operating savings; and authorizes SFMTA staff to, with FTA concurrence, seek reimbursement of all authorized costs associated with implementing "Option 4" from Central Subway Project contingency funding at the completion of the Central Subway Project.

I certify that the foregoing resolution was adopted by the San Francisco Municipal Transportation Agency Board of Directors at its meeting of February 19, 2013.

_____
Secretary to the Board of Directors
San Francisco Municipal Transportation Agency

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Appendix I

TRANSPORTATION AUTHORITY MEMORANDUM – COST EFFECTIVENESS CALCULATION

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TRANSPORTATIO AUTHORITY MEMORANDUM – COST EFFECTIVENESS CALCULATION

San Francisco County Transportation Authority
1455 Market Street, 22nd Floor
San Francisco, California 94103
415.522.4800 FAX 415.522.4829
info@sfcta.org www.sfcta.org

Memorandum

Date: 10.29.2014

To: Central Subway Project Team

From: Drew Cooper, Transportation Planner

Through: Elizabeth Sall, Deputy Director for Technology, Data, and Analysis

Subject: Central Subway Extension to Fisherman's Wharf Ridership Projections and Cost Effectiveness Calculation

This memo outlines the cost effectiveness calculation under the Federal Transit Administration's (FTA) New Starts guidelines for the Central Subway Extension to Fisherman's Wharf. Cost effectiveness, as defined in *New and Small Starts Evaluation and Rating Process Final Policy Guidance*, is the "annualized capital cost plus annual O&M cost of the project divided by the annual number of estimated trips on the project." Cost is calculated in 2014 dollars, and annualized over the effective life of the project. Because the project is in the feasibility stage and a final project design is not yet know, ridership and cost estimates are based on one representative alternative of several under consideration. Based on the calculations detailed in this memo, it is reasonable to conclude that the Central Subway Extension to Fisherman's Wharf would receive a "high" cost effectiveness rating using the current FTA guidelines.

This memo is organized as follows. First, ridership forecasts are discussed including tools used, input assumptions, and output summaries. Then, capital cost calculations are discussed, and then operating cost calculations, and finally the cost effectiveness calculation.

T-THIRD RIDERSHIP

Ridership forecasts were prepared using SF-CHAMP 4.3 Fury, the San Francisco County Transportation Authority's travel demand model. In order to estimate new riders on the T-Third as a result of the extension, we compared a baseline with a build model run for year 2040. The baseline model run represents our best understanding of land use and transportation in 2040, and includes the planned Central Subway currently under construction, terminating at Chinatown. The build scenario is identical to the baseline in all regards except that it includes a Central Subway extension to two additional stops: North Beach and Fisherman's Wharf. The T-Third will operate as two separate lines: a long line which runs the entire route length, and a short line which runs between the Central Subway's northern terminus south to the Mission Bay Loop near 20th Street. Each line will operate at 5-minute headways in the peak commute hours, resulting in a combined headway in the subway of 2.5 minutes. For a full discussion of model inputs, please refer to *2040 Central Subway Extension to Fisherman's Wharf Model Input Memo*. SF-CHAMP projects the Fisherman's Wharf extension to add 40,000 daily transit boardings to the T-Third. Using an annualization factor of 320, we estimate 12.9 million new trips per year.

CAPITAL COSTS

Capital costs were prepared by HNTB covering a wide range of potential alignments and construction techniques. We used alternative 1-2 with Sequential Excavation Mining (SEM) for North Beach Station. This alternative is consistent with the alternative used for ridership forecasts, adding stations at Union

Square on the Pagoda Theater site and at Conrad Square. Total construction and soft costs were estimated at $933 million. We also use high- and low-end estimates of +50% and -30% total cost for sensitivity. For further detail on capital cost estimates and constructability, please refer to *SFMTA Contract No. 173: Task Order 173-6, SFMTA T-Third LRT/Central Subway Phase 3 – Task 4: Constructability Analysis*. In addition to capital costs, we estimate needing to acquire three more trains to meet the service schedule with the extension. Each train consists of two Light Rail Vehicle cars. Each car costs $3.66M and each two-car train costs $7.32M, for a total cost of $22.0M for all three trains.

Annualized capital costs were calculated using Federal Transit Authority's *New and Small Starts Evaluation and Rating Process Final Policy Guidance*, using a 2% discount rate and the economic lifetime of each cost category as defined in the FTA Standard Cost Category (SCC) Workbook. Appendix A summarizes economic lifetimes using the 2014 New Starts SCC Workbook. The calculation proceeds as follows:

1. Capital costs by category were prepared by HNTB.
2. Professional services costs were spread proportionally across each capital cost category, excluding Category 70 Vehicles.
3. The professional services-adjusted cost is annualized using the economic life span and a 2% discount.
4. Each category's annualized capital cost is summed to obtain the total capital cost.
5. Low estimates and high estimates were calculated following the same procedure, but the former assumes a 30% overestimate of the point capital costs, and the latter assumes a 50% underestimate.
6. Capital costs for the acquisition of Light Rail Vehicles were held constant. They were not adjusted for a low-end and high-end estimate.

Annualized capital cost was found to range from $15.9 Million to $30.0 Million. Table 1 below summarizes capital cost estimates. Appendix B shows the full calculation.

Table 1: Summary of Capital Cost Estimates

	Low estimate	Point estimate	High estimate
Total Construction Cost ($M)	717.4	932.6	1,398.9
LRV Acquisition Cost ($M)	22.0	22.0	22.0
Total Capital Cost ($M)	**739.3**	**954.6**	**1,420.9**
Annualized Construction Cost ($M)	14.8	19.3	28.9
Annualized LRV Cost ($M)	1.1	1.1	1.1
Annualized Capital Cost ($M)	**15.9**	**20.4**	**30.0**

OPERATING COSTS

Operating costs were estimated using planned service levels, modeled and scheduled run time, and standard operating costs for Muni LRT vehicles. For the T-Third long line and short line separately, we

1. Derived daily vehicle miles and daily vehicle hours for T-Third service using scheduled and modeled run times.
2. Calculated the number of required peak-hour vehicles to meet planned service
3. Applied standard operating costs per vehicle-mile, per vehicle-hour, and vehicle-per-day to arrive at daily operating costs

4. Gross up to annual operating costs using an annualization factor of 320.
5. Took the difference of annual operating cost of the baseline scenario from the build scenario to get the annual incremental operating cost of the Central Subway extension to Fisherman's Wharf.

Tables 1 and 2 summarize these calculations below.

Table 2: Route Distance and Peak Model Adjusted Travel Times

	Distance (miles)			Travel Time (minutes)		
	Baseline	Build	Difference	Baseline	Build	Difference
T-Third						
Inbound	6.7	7.7	1.0	41.5	45.4	3.9
Outbound	6.7	7.7	1.0	41.5	45.6	4.0
Round Trip	13.4	15.4	2.0	83.0	90.9	7.9
T-Third Short						
Inbound	2.6	3.7	1.1	15.9	19.9	4.0
Outbound	2.6	3.7	1.1	16.5	20.5	4.1
Round Trip	5.2	7.4	2.2	32.4	40.5	8.1

Table 3: Daily Operating Costs

	Baseline			Build			Difference
	Unit	Cost/Unit	Cost ($)	Unit	Cost/Unit	Cost ($)	Cost ($)
T-Third							
Daily Vehicle Hours	258	153	39,276	281	153	42,821	3,546
Daily Vehicle Miles	2,151	24	51,230	2,472	24	58,876	7,646
Peak Vehicles	20	475	9,493	22	475	10,442	949
Subtotal			*99,998*			*112,139*	*12,141*
T-Third Short							
Daily Vehicle Hours	85	153	13,004	104	153	15,835	2,832
Daily Vehicle Miles	655	24	15,607	932	24	22,210	6,603
Peak Vehicles	9	475	4,272	10	475	4,747	475
Subtotal			*32,882*			*42,792*	*9,909*
Daily Operating Cost ($)			**132,881**			**154,931**	**22,051**
Annual Operating Cost ($M)			**42.5**			**49.6**	**7.1**

COST EFFECTIVENESS

As discussed above, the cost effectiveness for a New Starts project is the annualized cost of the project divided by the annual number of new trips on the project. Table 4 below summarizes the cost effectiveness calculation for the Central Subway Extension to Fisherman's Wharf. For alternative 1-2 with SEM for North Beach Station, we estimate a cost effectiveness of between 1.78 and 2.87, within the FTA's definition for a "High" rating of $4 per linked trip or less.

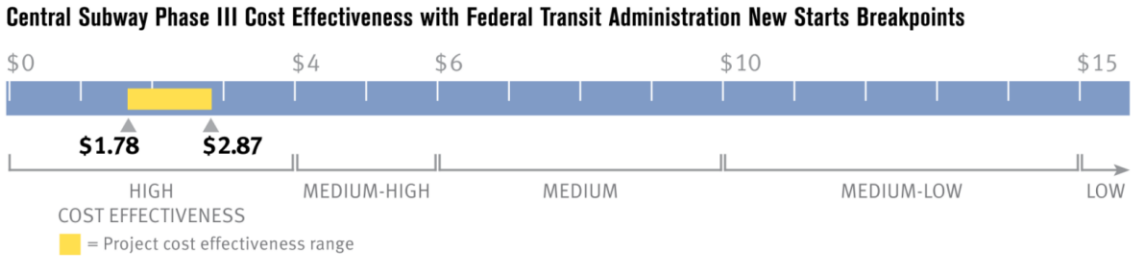

Figure 1 shows where this project falls within the FTA's New Starts cost effectiveness ranking.

Table 4: Cost Effectiveness Summary

Ridership	Daily	Annual (M)
Baseline boardings	74,168	23.7
CS Extension boardings	114,549	36.7
Effective ridership increase	**40,381**	**12.9**

Capital Cost (2014 $'s)	Low estimate	Point estimate	High estimate
Total Capital Cost ($M)	**739.4**	**954.6**	**1,420.9**
Annualized Capital Cost ($M)	**15.9**	**20.4**	**30.0**

Operating Cost (2014 $'s)	
Baseline annual operating cost ($M)	**42.5**
CS Extension annual operating cost ($M)	**49.6**
Incremental operating cost ($M/year)	**7.1**

Cost effectiveness	Low cost estimate	Point cost estimate	High cost estimate
Total Annualized Cost ($M)	23.0	27.4	37.1
Total Annual Ridership (M)	12.9	12.9	12.9
Cost effectiveness (2014 $'s/trip)	***1.78***	***2.12***	***2.87***

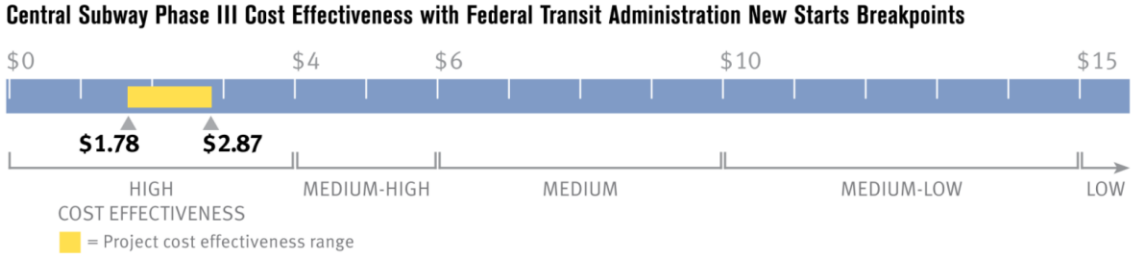

Figure 1: Central Subway Cost Effectiveness for FTA New Starts

For the purposes of this study, due to time and budget constraints, we only calculated cost effectiveness for the horizon year, and not the current year. Since the FTA's guidance directs that current-year cost effectiveness should be weighted equally at 50%-50% with forecast year cost effectiveness, the base year ridership could be half of the horizon year forecast and the project would still receive a "High" rating. Within the project area, the population in the base year is 71% of the forecast year population and employment is 78%. Additionally, the forecast year includes planned transit improvements that would compete with the T-Third for riders. Because of these, it is reasonable to assume that the current-year ridership on the project would meet or exceed 75% of the forecast-year ridership. Table 5 shows the

weighted cost effectiveness using these assumptions. The entire range still qualifies as a "High" rating, and would do so even if current-year ridership was only 50% of forecast-year.

Table 5: Current Year/Forecast Year Weighted Cost Effectiveness Example

Cost effectiveness	Low cost estimate	Point cost estimate	High cost estimate
Conservative Current Year Cost Effectiveness[1]	2.23	2.82	3.81
Forecast Year Cost Effectiveness	1.78	2.12	2.87
Weighted Cost Effectiveness	***2.07***	***2.47***	***3.34***

[1] For the purposes of this exercise, the current year cost effectiveness is represented as 75% of the forecast year cost effectiveness. This is deliberately a very conservative estimate (given that population and employment are at 71 and 78 percent of their forecast values) for the current-year cost-effectiveness was used to demonstrate that the "high" cost-effectiveness rating is fairly resilient.

APPENDIX A: YEARS OF USEFUL LIFE

Years of useful life are used to calculate the annualized capital cost of the project. Table 6 below summarizes the years of useful life for capital cost categories used in the capital cost calculation, as defined in the New Starts SCC Workbook.

Table 6: Standard Cost Categories for Capital Projects Used in this Study

10 GUIDEWAY & TRACK ELEMENTS (route miles)		**Years of Useful Life**
10.06	Guideway: Underground cut & cover	125
10.07	Guideway: Underground tunnel	125
10.09	Track: Direct fixation	30
10.12	Track: Special (switches, turnouts)	30
10.13	Track: Vibration and noise dampening	30
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)		
20.03	Underground station, stop, shelter, mall, terminal, platform	125
20.07	Elevators, escalators	30
40 SITEWORK & SPECIAL CONDITIONS		
40.01	Demolition, Clearing, Earthwork	125
40.02	Site Utilities, Utility Relocation	125
40.03	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	125
40.04	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	125
40.05	Site structures including retaining walls, sound walls	80
40.06	Pedestrian / bike access and accommodation, landscaping	20
40.07	Automobile, bus, van accessways including roads, parking lots	20
40.08	Temporary Facilities and other indirect costs during construction	100
50 SYSTEMS		
50.01	Train control and signals	30
50.02	Traffic signals and crossing protection	30
50.03	Traction power supply: substations	50
50.04	Traction power distribution: catenary and third rail	30
50.05	Communications	20
50.06	Fare collection system and equipment	25
60 ROW, LAND, EXISTING IMPROVEMENTS		
60.01	Purchase or lease of real estate	125
60.02	Relocation of existing households and businesses	125
60.03	**Services***	**125**
70 VEHICLES (number)		
70.01	Light Rail	25

*The 60.03 services category is not defined in the current New Starts SCC Workbook, and is assumed to be the same as other categories under 60 ROW, LAND, EXISTING IMPROVEMENTS

APPENDIX B: CALCULATION OF ANNUALIZED CAPITAL COSTS

The figure below shows annualized cost calculations based on HNTB's cost estimates and FTA's New Starts SCC Workbook.

ANNUALIZED COST-BUILD ALTERNATIVE (Current Year)

San Francisco Municipal Transportation Agency

Central Subway Phase III

	Quantity	Total Base Year Dollars (X000)	Cat. 80 Prof. Svc. spread proportionally over Cats. 10 - 50 (X000)	Spread Cat. 90 Unalloc. Cont. according to perceived risks (X000)	Revised Total Base Year Dollars (X000)	Years of Useful Life	Annualization Factor (based on 2% rate) [.02/1 - (1.02)^-no. yrs]	Annualized Cost (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)		**113,978**	**57,609**	**0**	**171,587**			**9,070**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0	0		0	125	0.0218	0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0	0		0	30	0.0446	0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0		0	20	0.0612	0
10.04 Guideway: Aerial structure	0.00	0	0		0	80	0.0252	0
10.05 Guideway: Built-up fill	0.00	0	0		0	80	0.0252	0
10.06 Guideway: Underground cut & cover	0.1326	107,955,004	54,564		162,519	125	0.0218	3,549
10.07 Guideway: Underground tunnel	0.6216	149,268,285	75,445		224,714	125	0.0218	4,907
10.08 Guideway: Retained cut or fill	0	0	0		0	125	0.0218	0
10.09 Track: Direct fixation	0.7542	3,705,543	1,873		5,578	30	0.0446	249
10.10 Track: Embedded	0	0	0		0	20	0.0612	0
10.11 Track: Ballasted	0	0	0		0	35	0.0400	0
10.12 Track: Special (switches, turnouts)	0.7542	378,486	191		570	30	0.0446	25
10.13 Track: Vibration and noise dampening	0.7542	5,041,792	2,548		7,590	30	0.0446	339
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)		**473,748**	**239,449**	**0**	**713,197**			**8,364**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0		0	70	0.0267	0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0		0	70	0.0267	0
20.03 Underground station, stop, shelter, mall, terminal, platform	2.0000	228,343,750	115,413		343,757	125	0.0218	7,507
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0		0	70	0.0267	0
20.05 Joint development	0	0	0		0	70	0.0267	0
20.06 Automobile parking multi-story structure	0	0	0		0	50	0.0318	0
20.07 Elevators, escalators	8.0000	2,132,550	17,060		19,193	30	0.0446	857
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		**0**	**0**	**0**	**0**			**0**
30.01 Administration Building: Office, sales, storage, revenue counting	0	0	0		0	50	0.0318	0
30.02 Light Maintenance Facility	0	0	0		0	50	0.0318	0
30.03 Heavy Maintenance Facility	0	0	0		0	50	0.0318	0
30.04 Storage or Maintenance of Way Building	0	0	0		0	50	0.0318	0
30.05 Yard and Yard Track	0	0	0		0	80	0.0252	0
40 SITEWORK & SPECIAL CONDITIONS		**12,003**	**6,067**	**0**	**18,069**			**591**
40.01 Demolition, Clearing, Earthwork	0.7542	2,033,937	1,028		3,062	125	0.0218	67
40.02 Site Utilities, Utility Relocation	0.7542	4,266,060	2,156		6,422	125	0.0218	140
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	0.7542	2,299,074	1,162		3,461	125	0.0218	76
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks	0.7542	1,047,598	529		1,577	125	0.0218	34
40.05 Site structures including retaining walls, sound walls	0.7542	149,423	76		225	80	0.0252	6
40.06 Pedestrian / bike access and accommodation, landscaping	0.7542	955,612	483		1,439	20	0.0612	88
40.07 Automobile, bus, van accessways including roads, parking lots	0	0	0		0	20	0.0612	0
40.08 Temporary Facilities and other indirect costs during construction	0.7542	5,163,485	2,610		7,773	100	0.0232	180
50 SYSTEMS		**10,506**	**5,310**	**0**	**15,816**			**825**
50.01 Train control and signals	0.7542	2,966,502	1,499		4,466	30	0.0446	199
50.02 Traffic signals and crossing protection	0.7542	255,223	129		384	30	0.0446	17
50.03 Traction power supply: substations	0.7542	1,697,988	858		2,556	50	0.0318	81
50.04 Traction power distribution: catenary and third rail	0.7542	3,196,000	1,615		4,811	30	0.0446	215
50.05 Communications	0.7542	2,267,613	1,146		3,414	20	0.0612	209
50.06 Fare collection system and equipment	2.0000	1,337,702	676		2,014	25	0.0512	103
50.07 Central Control	0	0	0		0	30	0.0446	0
Construction Subtotal (10 - 50)		**610,235**	**308,434**	**0**	**918,669**			**18,849**
60 ROW, LAND, EXISTING IMPROVEMENTS		**13,932**	**7,042**	**0**	**20,974**			**403**
60.01 Purchase or lease of real estate	0.7542	14,910,401			14,910	125	0.0218	326
60.02 Relocation of existing households and businesse	0.7542	1,727,595			1,728	125	0.0218	38
60.03 Services	0.7542	1,835,636			1,836	125	0.0218	40
70 VEHICLES (number)	3	21,960		0	21,960			1,125
70.01 Light Rail	3	7,320			21,960	25	0.0512	1,125
70.02 Heavy Rail	0	0			0	25	0.0512	0
70.03 Commuter Rail	0	0			0	25	0.0512	0
70.04 Bus	0	0			0	12	0.0946	0
70.05 Other	0	0			0	12	0.0946	0
70.06 Non-revenue vehicles	0	0			0	12	0.0946	0
70.07 Spare parts	0	0			0	12	0.0946	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)		308,434						
80.01 Project Development		40,500						
80.02 Engineering		76,243						
80.03 Project Management for Design and Construction		63,229						
80.04 Construction Administration & Management		71,693						
80.05 Professional Liability and other Non-Construction Insurance		27,222						
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		12,883						
80.07 Surveys, Testing, Investigation, Inspection		2,621						
80.08 Start up		10,975						
80.09 Other		3,068						
Subtotal (10 - 80)		**932,601**						
90 UNALLOCATED CONTINGENCY								
TOTAL		**932,601**	308,434	0	**961,603**			19,252

NEW STARTS ENRICHMENTS	**Calculation**	**Amount**
Artwork, Landscaping, and Bicycle and Pedestrian Improvements	100 percent of the annualized cost of SCC ALI 40.06, if enrichment is claimed	0
Sustainable Building Design Features	2.5 percent of the total qualifying annualized cost of the following SCC ALIs for which enrichment is claimed: 20.01, 20.02, 20.03, 20.04, 30.01, 30.02, 30.03, 30.04	0
Alternative Energy Bus Vehicles	50 percent of the qualifying annualized cost of SCC ALI 70.04, if enrichment is claimed	0
Joint Development	100 percent of the annualized cost of SCC ALI 20.05, if enrichment is claimed	0
ANNUALIZED CAPITAL COST EXCLUDING ENRICHMENTS	**Enter this figure in the New Starts Mobility and Cost Effectiveness template (this figure is not rounded to the nearest thousand) -->**	**19,252,412**

Figure 2: New Starts Annualized Capital Cost Calculation

CITATIONS

HNTB. (2014). *SFMTA Contract No. 173: Task Order 173-6, SFMTA T-Third LRT/Central Subway Phase 3, Task 4: Constructability Analysis.* San Francisco: HNTB.

U.S. Department of Transportation: Federal Transit Administration. (2013, August). New and Small Starts Evaluation and Rating Process: Final Policy Guidance. Retrieved 2014, from http://www.fta.dot.gov/documents/NS-SS_Final_PolicyGuidance_August_2013.pdf

U.S. Department of Transportation: Federal Transit Administration. (2014, June 16). New Starts SCC Workbook. Retrieved 2014, from http://www.fta.dot.gov/documents/SCC_Workbook_Rev_16_NEW_STARTS.xls

Appendix J

T-THIRD – PHASE 3 CONCEPT STUDY – AUTHORIZATION ACTION – TRANSPORTATION AUTHORITY BOARD OF DIRECTORS

T-THIRD – PHASE 3 CONCEPT STUDY – AUTHORIZATION ACTION – TRANSPORTATION AUTHORITY BOARD OF DIRECTORS

Item 9 Enclosure
Transportation Authority Board
March 25, 2014

Prop K/AA Grouped Allocation Requests
March 2014 Board Action

Enclosure Table of Contents

No.	Fund Source	Project Sponsor[1]	EP[2] Line Item/ Category Description	Project Name	Phase	Funds Requested	Page No.
1	Prop K	TJPA	Downtown Extension to a Rebuilt Transbay Terminal	Transbay Transit Center	Design, Construction	$3,450,000	1
2	Prop K	BART	BART Station Access, Safety and Capacity	Embarcadero & Montgomery Capacity Implementation Strategy	Planning	$112,500	15
3	Prop K	SFCTA, DPW	Relocation of Paul Street Caltrain Station to Oakdale Avenue	Quint-Jerrold Connector Road	Conceptual Engineering, Environmental Studies	$123,972	41
4	Prop K	SFMTA	Bicycle Circulation/Safety	King Street Bicycle Lanes	Environmental, Design, Construction	$34,000	63
5	Prop K	DPW	Transportation/ Land Use Coordination	2nd Street Improvement	Environmental, Design	$172,842	75
6	Prop K	PCJPB	Transportation/ Land Use Coordination	Caltrain North Terminal Study	Planning	$22,940	95
7	Prop K	SFMTA	Transportation/ Land Use Coordination	19th Avenue/M-Ocean View	Planning	$306,000	113
8	Prop K	SFCTA, SFMTA	Transportation/ Land Use Coordination	Central Subway Phase 3 - Initial Study	Planning	$173,212	141
9	Prop AA	MOHCD	Transit Reliability and Mobility Improvements	Hunters View Transit Connection	Construction	$1,844,994	163
				Total Requested		$6,240,460	

[1] Acronyms include BART (Bay Area Rapid Transit District); DPW (Department of Public Works); MOHCD (Mayor's Office of Housing & Community Development); PCJPB (Peninsula Corridor Joint Powers Board); SFCTA (San Francisco County Transportation Authority); SFMTA (San Francisco Municipal Transportation Agency); and Transbay Joint Powers Authority (TJPA).

[2] EP stands for Expenditure Plan; DTX stands for Caltrain Downtown Extension.

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E9-141

San Francisco County Transportation Authority
Prop K/Prop AA Allocation Request Form

FY of Allocation Action:	2013/14
Project Name:	Central Subway- Phase III - Initial Study
Implementing Agency:	San Francisco Municipal Transportation Agency

EXPENDITURE PLAN INFORMATION

Prop K Category:	D. TSM/Strategic Initiatives	Gray cells will automatically be filled in.
Prop K Subcategory:	ii. Transportation/Land Use Coordination	
Prop K EP Project/Program:	b. Transportation/Land Use Coordination	
Prop K EP Line Number (Primary):	44	Current Prop K Request: $ 173,212
Prop K Other EP Line Numbers:		
Prop AA Category:		
		Current Prop AA Request: $ -
		Supervisorial District(s): 2,3

SCOPE

Sufficient scope detail should be provided to allow Authority staff to evaluate the reasonableness of the proposed budget and schedule. If there are prior allocations for the same project, provide an update on progress. Describe any outreach activities included in the scope. Long scopes may be provided in a separate Word file. Maps, drawings, etc. should be provided on Worksheet 7-Maps.or by inserting additional worksheets.

Project sponsors shall provide a brief explanation of how the project was prioritized for funding, highlighting: 1) project benefits, 2) level of public input into the prioritization process, and 3) whether the project is included in any adopted plans, including Prop K/Prop AA 5-Year Prioritization Program (5YPPs). Justify any inconsistencies with the adopted Prop K/Prop AA Strategic Plans and/or relevant 5YPPs.

Indicate whether work is to be performed by outside consultants and/or by force account.

The San Francisco Municipal Transportation Agency (SFMTA) requests an allocation of $75,125 in Prop K funds and an appropriation of $98,087 in Prop K funds to the San Francisco County Transportation Authority (SFCTA) for the Central Subway Phase III - Initial Study. This request would fund an initial planning study to determine the high-level feasibility and issues for a northern extension of the Central Subway from its current planned terminus in Chinatown to Fisherman's Wharf. This initial feasibility assessment will be useful in determining future land acquisitions and in the forthcoming SFMTA Rail Capacity Study.

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San Francisco County Transportation Authority
Proposition K/Prop AA Allocation Request Form

SCOPE OF WORK
Central Subway – Phase III Initial Study
FINAL - PENDING

Background

The T-Third Light Rail Transit (LRT) line opened in April 2007 as the first new rail line in the eastern part of San Francisco in over 50 years. The new rail line extended 5.1 miles from the San Francisco County Line near Visitacion Valley to the Caltrain Station at 4th and King Streets. Phase II of T-Line will extend the line from 4th and King Streets to Stockton and Clay Streets in Chinatown. The $1.5 billion, 1.7 mile long extension will include four new stations and address transit need and congestion in a busy north-south corridor in the heart of downtown San Francisco. Phase II has received a full funding grant agreement (FFGA) from the Federal Transit Administration (FTA). The extension is expected to open for service in 2019. The actual Phase II construction will reach into North Beach where the tunnel boring machines will be removed from the ground at the intersection of Powell Street, Columbus Avenue and Union Street (Pagoda Palace site).

Study Objectives

The Central Subway – Phase III Initial Study ("Initial Study") will analyze at a high-level the potential feasibility, benefits, and issues of extension of the T-Third LRT line from Chinatown (the northernmost station of Phase II) through North Beach and Russian Hill to Fisherman's Wharf. Three possible alignments will be examined as a part of the Initial Study.

The Initial Study will be a multi-agency effort led by the San Francisco Municipal Transportation Agency (SFMTA) with input from the San Francisco County Transportation Authority (SFCTA) and the San Francisco Department of Planning (SF Planning).

The report will focus on feasibility with respect to the following items key areas:

- Alignment
- Grade Options
- Construction Methods
- Land Use & Economic Development
- Transit & Traffic Analysis
- Costs & Funding

The following table outlines the key focus areas that will be addressed with initial preferred action, but may change as more information is gathered.

Task Summary

1. Administration and Ongoing Management
2. Transportation Analysis
3. Land Use and Economic Conditions Analysis
4. Constructability Analysis

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San Francisco County Transportation Authority
Proposition K/Prop AA Allocation Request Form

5. Costs, Funding, and Next Steps
6. Final Report

1. Administration and Ongoing Management

Task 1.1: Finalize Initial Study scope, agency roles, consultant roles, and tentative schedule among the SFMTA, SFCTA, and SF Planning and applicable on-call consultant services. Execute project charter among the three agencies to finalize roles, responsibilities and procedures. Establish planning goals and study outline.

- SFCTA will manage the distribution of funds, lead the transportation modeling and FTA New Starts ratings calculations, and assist with transportation analysis.
- SF Planning will write the scope of work for the economic development consultant task order and lead the analysis of land use and economic development.
- SFMTA will lead and manage the overall project and be responsible for all final deliverables.

Task 1.2: SFMTA will convene regular project meetings (once a month or more based on deliverables) with key staff from SFMTA, SF Planning, and SFCTA. SFMTA will create and distribute agendas prior to meetings and distribute notes and action items via email following meetings.

Task	Deliverables	Documentation	Roles
1.1	• Final Scope • Project Charter • Executed Consultant Task Orders • Initial Study outline	Documents themselves	• SFMTA will lead scope finalizing and project charter, with SF Planning and SFCTA participating • SFMTA will lead the Initial Study outline, with SF Planning and SFCTA participating and reviewing • SF Planning will create a consultant task order scope for the economic development • SFCTA will execute consultant task orders
1.2	• Management meetings	Meeting agendas, notes, and action items.	• SFMTA to schedule meetings, create and distribute meeting agendas and record and distribute notes and action items to SFCTA, and SF Planning • SFCTA, SFMTA, and SF Planning will attend meetings

2. Transportation Analysis

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San Francisco County Transportation Authority
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Task 2.1: SFMTA will summarize existing and currently planned transit service and traffic conditions that are projected to be present in the project area (North Beach, Russian Hill, Telegraph Hill, Fisherman's Wharf) upon completion of Phase II of the T-Third LRT line. The summary will include service and frequencies of transit service (including any proposed changes from the Transit Effectiveness Project), transit facilities (i.e. transit only lanes), and street network configurations for automobiles and non-motorized travel.

Task 2.2: SFMTA will evaluate issues present concerning the addition of a new station in the North Beach area at the site of the Pagoda Palace or in the immediate vicinity.

Task 2.3: SFMTA will summarize conceptual alignment and station options for a Phase III extension of the Central Subway north of the existing line end at the intersection of Powell Street, Columbus Avenue and Union Street. This summary will include discussion of potential nexus opportunities with other transportation and public realm plans (i.e. Conrad Square). In addition, it will document the relative size and service quality (i.e. crowding levels, congestion, wait time, speed) of the travel markets that various alignments and station options would serve (i.e. tourists, convention attendees, residents, workers). This section will also document any communities of concern and location of populations with unique travel needs (i.e. zero auto and low income households).

Task 2.4: The Transportation Authority will develop preliminary travel ridership projections for the Phase III extension based on a representative land use and service plan scenario. These projections will drive a high-level analysis of New Starts competitiveness.

Task	Deliverables	Documentation	Roles
2.1	Summary of existing transit service and traffic conditions (post Phase II completion)	Section in Initial Study report.	SFMTA will lead task, SFCTA and SF Planning will review.
2.2	Summary of issues concerning a North Beach station	Section in Initial Study report.	SFMTA will lead task, SFCTA and SF Planning will review.
2.3	Summary of conceptual alignment options	Section in Initial Study report.	SFMTA will lead task, SFCTA and SF Planning will review.
2.4	Preliminary Ridership Forecasts	Section in Initial Study report.	SFCTA will lead task, SFMTA and SF Planning will review.

3. Land Use and Economic Conditions Analysis

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San Francisco County Transportation Authority
Proposition K/Prop AA Allocation Request Form

Task 3.1: SF Planning will summarize existing and future land use conditions within the project area. Future conditions will both assume an "existing conditions" scenario without a Phase III Central Subway extension, and a build scenario with a Phase III Central Subway extension.

Task 3.2: SF Planning will summarize existing and future conditions within the project area with an emphasis on topography of the project area.

Task 3.3: SF Planning with consultant support will summarize existing and future conditions for economic conditions within the project area. Future conditions will assume an "existing conditions" scenario without a Phase III Central Subway extension, and a build scenario with a Phase III Central Subway extension. This analysis will include the role of various travel markets that Phase III would serve in supporting our economy (i.e. visitors, and large employers).

Task	Deliverables	Documentation	Roles
3.1	Summary of existing and future land use conditions within the project area.	Section in Initial Study report.	SF Planning to lead, SFMTA and SFCTA to review.
3.2	Summary of existing and future land forms (topography) within the project area	Section in Initial Study report.	SF Planning to lead, SFMTA and SFCTA to review.
3.3	Summary of existing and future economic conditions	Section in Initial Study report.	Consultant-led task, managed by SF Planning, with SFMTA and SFCTA review.

4. Constructability Analysis

The Initial Study will evaluate the constructability of various horizontal and vertical alignments and station locations with regards to geotechnical conditions, construction methods, sea level rise vulnerability, major utility conflicts and construction costs.

Task 4.1: The SFMTA with consultant support will evaluate preliminary alignment profiles based on existing geotechnical information

Task 4.2: The SFMTA with consultant support will discuss feasibility and recommendation of construction method for the alignments

Task 4.3: The SFMTA will identify potential major utility conflicts based on existing information

Task 4.4: The SFMTA with consultant support will conduct a risk analysis with regards to sea level change

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Task 4.5: The SFMTA with consultant support will prepare a preliminary construction cost estimate

Task	Deliverables	Documentation	Roles
4.1	Geotechnical assessment	Section in Initial Study report.	Consultant-led task with management by SFMTA, SFCTA review.
4.2	Construction method feasibility	Section in Initial Study report.	Consultant-led task with management by SFMTA, SFCTA review.
4.3	Identification of potential major utility conflicts	Section in Initial Study report.	SFMTA lead, SFCTA review.
4.4	Risk analysis with regards to sea level change	Section in Initial Study report.	Consultant-led task with management by SFMTA, SFCTA review.
4.5	Preliminary construction cost estimate	Section in Initial Study report.	Consultant-led task with management by SFMTA, SFCTA review.

5. Costs, Funding and Next Steps

Task 5.1: The SFMTA will use the results of Task 4.5 to perform high-level project-level cost estimates for promising options and summarize findings.

Task 5.2: The SFMTA will perform an initial analysis of existing and future public and public/private funding sources including but not limited to development contributions, tax increment and other funding opportunities from potential land-use zoning changes. The list of existing funding strategies will include but not be limited to federal New Starts funding, local sales tax funding, and other available local sources in addition to the private contributions from potential land-use changes. The Transportation Authority will perform a high-level calculation of a potential New Starts rating based on results from the transportation ridership analysis in Task 2.

Task 5.3: The SFMTA will document potential next steps and agency responsibilities for Central Subway Phase III. The Initial Study will reference the SFMTA Rail Capacity Improvement Strategy to develop a citywide rail transit optimization and expansion assessment during 2014 that will be the successor to the "Four Corridors Plan" adopted in 1995.

Task	Deliverables	Documentation	Roles
5.1	Summary of high-level cost estimates	Section in Initial Study report.	SFMTA to lead, SFCTA to review.
5.2	Summary of existing funding	Section in Initial Study report.	SFMTA to lead; SFCTA will

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	sources		develop New Starts ratings; SF Planning will develop funding potential from land use strategies.
5.3	Outline next steps and responsibilities.	Section in Initial Study report.	SFMTA to lead, SFCTA and SF Planning to review.

6. Final Report

Task 6.1: SFMTA will draft a final report summarizing all relevant information, findings and conclusions and information will be developed in the several deliverables listed in this scope of work summary.

Task 6.2: SFMTA will produce a presentation summarizing the Report's findings and recommendations. This presentation may be used for public outreach, presentation to policy boards and executive staff, and other uses as needed.

Task	Deliverables	Documentation	Roles
6.1	Final Report	Final report document	SFMTA to lead, SF Planning and SFCTA to review.
6.2	Final Report Presentation	Final report slide deck	SFMTA to lead, SF Planning and SFCTA to review.

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FY 2013/14

Project Name: Central Subway- Phase III - Initial Study

Implementing Agency: San Francisco Municipal Transportation Agency

ENVIRONMENTAL CLEARANCE

Type : Categorically Exempt

Completion Date (mm/dd/yy)

Status: Not Applicable

PROJECT DELIVERY MILESTONES

Enter dates for ALL project phases, not just for the current request. Use July 1 as the start of the fiscal year. Use 1, 2, 3, 4 to denote quarters and XXXX/XX for the fiscal year (e.g. 2010/11). Additional schedule detail may be provided in the text box below.

	Start Date		End Date	
	Quarter	Fiscal Year	Quarter	Fiscal Year
Planning/Conceptual Engineering	3	2013/14	1	2014/15
Environmental Studies (PA&ED)				
R/W Activities/Acquisition				
Design Engineering (PS&E)				
Prepare Bid Documents				
Advertise Construction				
Start Construction (e.g., Award Contract)				
Procurement (e.g. rolling stock)				
Project Completion (i.e., Open for Use)				
Project Closeout (i.e., final expenses incurred)				

SCHEDULE COORDINATION/NOTES

Provide project delivery milestones for each sub-project in the current request and a schedule for public involvement, if appropriate. For planning efforts, provide start/end dates by task here or in the scope (Tab 1). Describe coordination with other project schedules or external deadlines (e.g., obligation deadlines) that impact the project schedule, if relevant.

The study is anticipated to be completed by July 2014.

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San Francisco County Transportation Authority
Prop K/Prop AA Allocation Request Form

FY 2013/14

Project Name: Central Subway- Phase III - Initial Study

Implementing Agency: San Francisco Municipal Transportation Agency

COST SUMMARY BY PHASE - CURRENT REQUEST

Allocations will generally be for one phase only. Multi-phase allocations will be considered on a case-by-case basis.

Enter the total cost for the phase or partial (but useful segment) phase (e.g. Islais Creek Phase 1 construction) covered by the CURRENT funding request.

	Yes/No	Cost for Current Request/Phase		
		Total Cost	Current Request	Prop AA - Current Request
Planning/Conceptual Engineering	Yes	$ 173,212	$ 173,212	
Environmental Studies (PA&ED)				
Design Engineering (PS&E)				
R/W Activities/Acquisition				
Construction				
Procurement (e.g. rolling stock)				
		$ 173,212	$ 173,212	$ -

COST SUMMARY BY PHASE - ENTIRE PROJECT

Show total cost for ALL project phases based on best available information. **Source of cost estimate** (e.g. 35% design, vendor quote) is intended to help gauge the quality of the cost estimate, which should improve in reliability the farther along a project is in its development.

	Total Cost	Source of Cost Estimate
Planning/Conceptual Engineering	$ 173,212	Similar efforts
Environmental Studies (PA&ED)		
Design Engineering (PS&E)		
R/W Activities/Acquisition		
Construction		
Procurement (e.g. rolling stock)		
Total:	$ 173,212	

% Complete of Design: N/A as of N/A

Expected Useful Life: N/A Years

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MAJOR LINE ITEM BUDGET

1. Provide a major line item budget, with subtotals by task and phase. More detail is required the farther along the project is in the development phase. Planning studies should provide task-level budget information.
2. Requests for project development should include preliminary estimates for later phases such as construction.
3. Support costs and contingencies should be called out in each phase, as appropriate. Provide both dollar amounts and % (e.g. % of construction) for support costs and contingencies.
4. For work to be performed by agency staff rather than consultants, provide base rate, overhead multiplier, and fully burdened rates by position with FTE (full-time equivalent) ratio. A sample format is provided below.
5. For construction costs, please include budget details. A sample format is provided below. Please note if work will be performed through a contract.
6. For any contract work, please provide the LBE/SBE/DBE goals as applicable to the contract.

Central Subway Phase III - Initial Study - Budget Totals

	Totals by Task	SFMTA	SFCTA	SF Planning	Contingency
Administration and Ongoing					
1 Management	$ 14,126	$ 4,100	$ 8,286	$ 1,740	$ -
2 Transportation Analysis	$ 24,344	$ 16,400	$ 7,074	$ 870	$ -
3 Land Use and Economic Analysis	$ 58,039	$ 984	$ 230	$ 26,825	$ 30,000
4 Constructability Analysis	$ 55,900	$ 4,920	$ 690	$ 290	$ 50,000
5 Costs, Funding, and Next Steps	$ 7,123	$ 3,936	$ 1,012	$ 2,175	$ -
6 Final Report	$ 13,680	$ 9,840	$ 795	$ 3,045	$ -
Totals	$ 173,212	$ 40,180	$ 18,087	$ 34,945	$ 80,000

Summary by Agency	Amount
SFCTA (Consultant plus Staff)	$ 98,087
SFMTA	$ 40,180
SF Planning	$ 34,945
Total	$ 173,212

Central Subway Phase III - Initial Study - SFCTA

	SFCTA Task Subtotal	Transportation Planner	Senior Transportation Planner	Deputy Director	Intern	Contract Administration
Hourly Rates		$ 59	$ 69	$ 115	$ 35	$64
Administration and Ongoing						
1 Management	$ 8,286		4	14		100
2 Analysis of Transportation Alternatives	$ 7,074	50	16	8	60	
3 Land use Analysis	$ 230			2		
4 Constructability Analysis	$ 690			6		
5 Costs, Funding, and Next Steps	$ 1,012		8	4		
6 Final Report	$ 795	1	4	4		
Sub-Total - Hours	281	51	32	38	60	100
Sub-Total - Cost	$ 18,087	$ 3,009	$ 2,208	$ 4,370	$ 2,100	$ 6,400

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Central Subway Phase III - Initial Study - SFMTA

	SFMTA Task Subtotal	Transit Planner IV
Hourly Rates		$ 164
Administration and Ongoing		
1 Management	$ 4,100	25
2 Transportation Analysis	$ 16,400	100
3 Land Use Analysis	$ 984	6
4 Constructability Analysis	$ 4,920	30
5 Costs, Funding, and Next Steps	$ 3,936	24
6 Final Report	$ 9,840	60
Hours	245	245
Cost	$ 40,180	$ 40,180

Central Subway Phase III - Initial Study - SF Planning

	SF Planning Task Subtotal	Planner III
Hourly Rates		$ 145
1 Administration and Ongoing	$ 1,740	12
2 Transportation Analysis	$ 870	6
3 Land Use and Economic Analysis	$ 26,825	185
4 Constructability Analysis	$ 290	2
5 Costs, Funding, and Next Steps	$ 2,175	15
6 Final Report	$ 3,045	21
Sub-Total - Hours	241	241
Sub-Total - Cost	$ 34,945	$ 34,945

Central Subway Phase III - Initial Study - Consultant

	Consultant Task Subtotal
Hourly Rates	
1 Administration and Ongoing	
2 Transportation Analysis	
3 Land Use and Economic Analysis	$ 30,000
4 Constructability Analysis	$ 50,000
5 Costs, Funding, and Next Steps	
6 Final Report	
Sub-Total - Cost	$ 80,000